User Manual

version 2.1

Covera Zone 2.1: User Manual

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Table of Contents

1. Introduction 1
    - What is Covera Zone? 1
        - What's new in Covera Zone 2.1? 1
        - Comparing Covera and Covera Zone 1
    - System requirements 2
    - Installing Covera Zone 3
    - License Activation 6
    - On-line support 8
2. WLAN basics 9
    - Network Architecture 9
    - Transmitter and receiver 10
    - Radiated power 10
    - Path loss 10
    - Effect of obstacles 11
    - Receiver Sensitivity 13
    - Factors impacting RSSI 14
    - Why Covera Zone? 14
    - Tips for surveys 15
3. Getting started 16
    - Creating a project 16
    - Adding a campaign to a project 17
    - Calibrating a map 20
    - Controlling the map display 22
    - Survey Points 24
        - Adding a survey point 25
        - Content of a Survey Point 25
        - Moving a survey point 26
        - Renaming a survey point 27
        - Updating a Survey Point 28
        - Deleting survey points 29
    - Views 29
        - Calculating a view 30
        - Adding a view 31
    - Generating reports 33
4. User Interface Reference 37
    - Overview 38
    - Modes 39
    - Dock Area 39
        - Dockable Tools 40
    - Map area 41
    - Menu 42
        - File menu 42
        - Edit Menu 42
        - Mode menu 43
        - Tools menu 44
        - Device menu 44
        - Help menu 44
    - Keyboard shortcuts 44
    - Map tool bar 45
    - Survey tool bar 45
    - Campaign Wizard 46

View Wizard 47
Find dialog 50
Survey mode tools 51
Signal graph 52
Campaign manager 52
Visible APs 53
Wireless Connection 54
Chase AP 55
GPS 56
IP layer performance 57
View mode tools 62
View Manager 62
View Properties 63
Heat Map Color Scale 69
Contour Lines 74
Report mode tools 79
Report Manager 79
Composition 81
Common tools 83
Survey Point Data 84
Access Point Data 85
Options 86
General options 87
User interface options 88
Gps receiver options 88
Survey options 89
Sound options 90
5. How to? 91
How to visualize the coverage of an access point? 91
How to locate stations on the map? 98
How to merge survey points from two different projects? 100
How to set-up a GPS receiver? 100
How to measure HTTP throughput? 103
How to make Iperf measurements? 106
How to georeference a map? 109
6. Frequently Asked Questions 114
Glossary 117
Index 118

Chapter 1. Introduction

Table of Contents

What is Covera Zone? 1
    What's new in Covera Zone 2.1? 1
    Comparing Covera and Covera Zone 1
System requirements 2
Installing Covera Zone 3
License Activation 6
On-line support 8

What is Covera Zone?

Covera Zone is a wireless LAN site survey application and coverage visualization software for Windows XP and Windows Vista. The main features of Covera Zone are:

- Survey: Collect signal data (and many other measurements) during site survey campaigns. Optional GPS support for outdoor survey.
- Visualize: Calculate views based on the survey data (heat maps or contour lines).
- Communicate: Create reports based on site survey data and generated views (HTML, RTF, or KML).

What's new in Covera Zone 2.1?

Some of the most important new features of Covera Zone 2.1 are listed below:

- Support for Windows Vista
- Tab navigation for campaigns and views.
- Improved signal graph (show both instant and averaged RSSI)
- Drag and drop of access point to the map.
- A new fast and easy to use regression algorithm.
- Source filter mechanism to select the access point that make up a view.
- Possibility to create cross campaign compositions.
- Improved report mode
- ... and many other bug fixes and user interface enhancements.

Comparing Covera and Covera Zone

The family of Covera branded products is composed of:

- **Covera**, a freeware application aimed at wireless site survey data acquisition.

- **Covera Zone**, an application that builds on top of **Covera** and allows you to visualize coverage zones by using sophisticated regression algorithm to calculate views, and communicate these by generating professional looking reports.

Feature	Covera	Covera Zone
Data collection	X	X
GPS	X	X
HTTP, Iperf measurements	X	X
Calculate regression views		X
Create reports		X
License Price	Free	on-line store

System requirements

Covera Zone has been designed to work with computers or tablet PCs with a Wi-Fi interface (802.11 a/b/g) and running one the following operating systems:

- Microsoft Windows XP SP2 (x86)
- Microsoft Windows XP SP3 (x86)
- Microsoft Windows Vista (x86 and x64)
- Microsoft Windows Vista SP1 (x86 and x64)

Minimum configuration:

- 1 Ghz processor
- 256 MByte of available RAM
- 65536 color video card - 1024x768
- 80 MByte of free disk space

Recommended configuration:

- 2 Ghz processor
- 512 MByte of available RAM
- True Color Video Card (24 or 32 bits - 16,8 M colors) - 1280x1024
- 150 MByte of disk space

For GPS assisted site surveys, you can use a NMEA 0183 compatible GPS receiver with a serial port. For USB and Bluetooth GPS receivers without a physical serial port, you may use virtual serial port software drivers supplied by the GPS reciver manufacturer.

Note

Some Wi-Fi interface drivers may be detected as *Bad Drivers* on your system. In this case, you will be invited to upgrade to the latest drivers when launching Covera Zone 2.1. This will ensure that Covera Zone works as expected and offers the best performance.

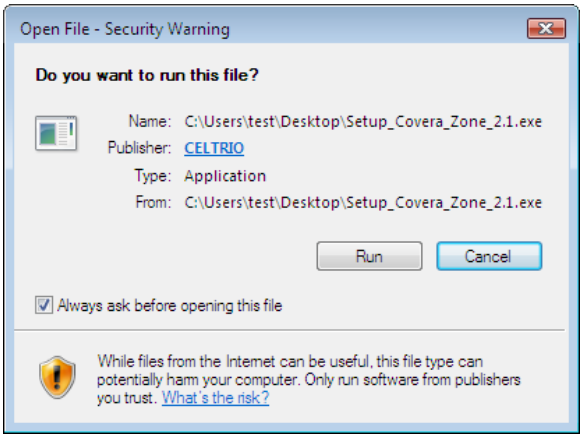
Installing Covera Zone

Once you have obtained the installer file, follow this procedure to install the software on your system.

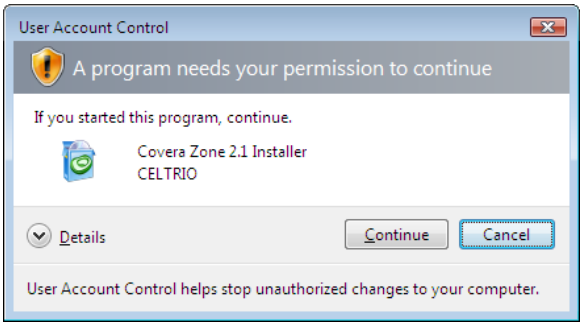
1. Double click on the installer file **Setup_Covera_Zone_2.1.exe**.

> **Note**
> If you are installing Covera Zone on a Windows XP machine, make sure you are using an account with *Administrator privileges*.

2. Under Windows Vista and depending on the machine's security settings, you may see the following additional dialogs.

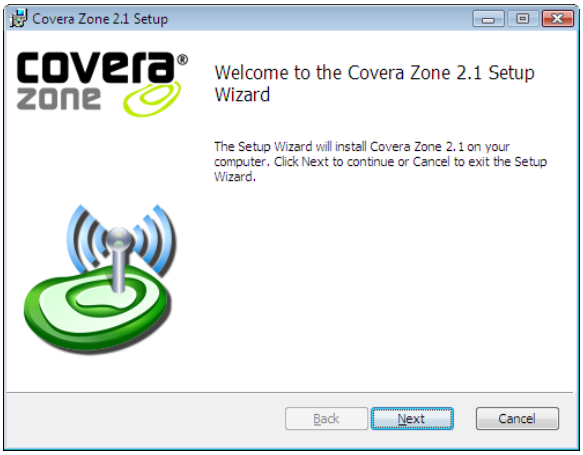

Open File - Security Warning
Do you want to run this file?
Name: C:\Users\test\Desktop\Setup_Covera_Zone_2.1.exe
Publisher: CELTRIO
Type: Application
From: C:\Users\test\Desktop\Setup_Covera_Zone_2.1.exe
Run
Cancel
Always ask before opening this file
While files from the Internet can be useful, this file type can potentially harm your computer. Only run software from publishers you trust. What's the risk?

Click on **Run**.



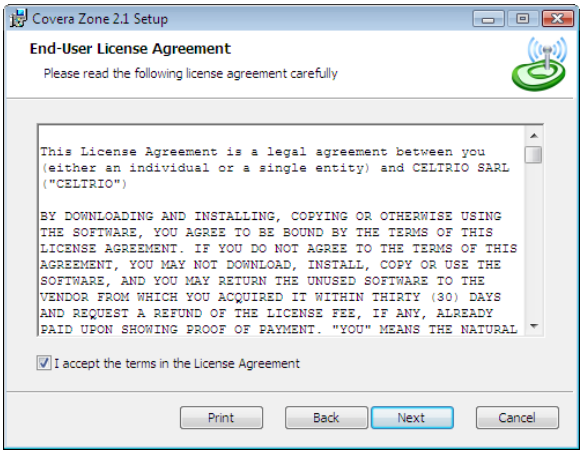
Click on **Continue**.

3. This will launch the **Covera Zone** installer wizard:

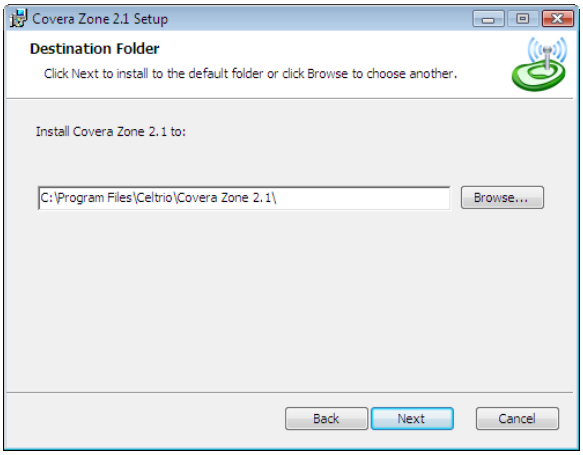

Covera Zone 2.1 Setup
covera zone
Welcome to the Covera Zone 2.1 Setup Wizard
The Setup Wizard will install Covera Zone 2.1 on your computer. Click Next to continue or Cancel to exit the Setup Wizard.
Back
Next
Cancel

Click on **Next** to start the installation procedure. If you want to exit the procedure, just press **Cancel**.

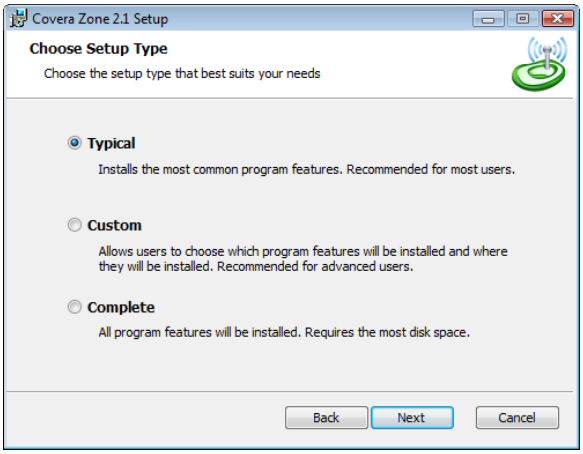
4. Read the License Agreement and check the **I accept the terms in the License Agreement** box, then press **Next**.


Covera Zone 2.1 Setup
End-User License Agreement
Please read the following license agreement carefully
This License Agreement is a legal agreement between you (either an individual or a single entity) and CELTRIO SARL ("CELTRIO")
BY DOWNLOADING AND INSTALLING, COPYING OR OTHERWISE USING THE SOFTWARE, YOU AGREE TO BE BOUND BY THE TERMS OF THIS LICENSE AGREEMENT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, YOU MAY NOT DOWNLOAD, INSTALL, COPY OR USE THE SOFTWARE, AND YOU MAY RETURN THE UNUSED SOFTWARE TO THE VENDOR FROM WHICH YOU ACQUIRED IT WITHIN THIRTY (30) DAYS AND REQUEST A REFUND OF THE LICENSE FEE, IF ANY, ALREADY PAID UPON SHOWING PROOF OF PAYMENT. "YOU" MEANS THE NATURAL
I accept the terms in the License Agreement
Print
Back
Next
Cancel

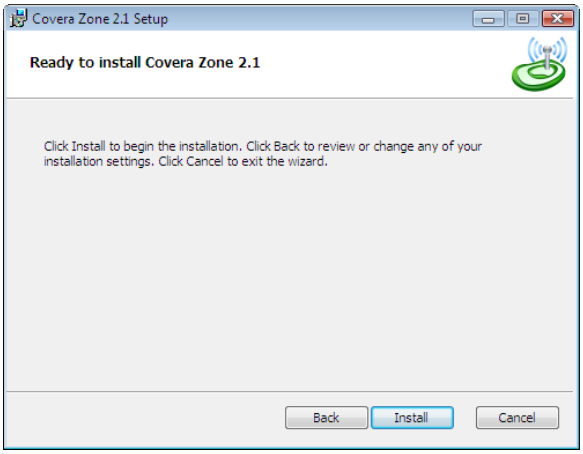
5. If you want to install **Covera Zone** in a different place than the proposed folder, you can specify it on this screen. Press **Next** to continue.



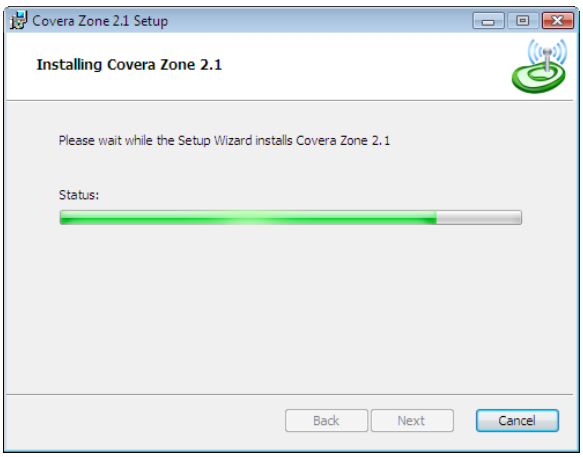
6. On this screen, you can choose to make a **Typical** installation or to select components for a **Custom** installation. It is recommended to choose the **Typical** installation. Press **Next** to continue.


Covera Zone 2.1 Setup
Choose Setup Type
Choose the setup type that best suits your needs
Typical
Installs the most common program features. Recommended for most users.
Custom
Allows users to choose which program features will be installed and where they will be installed. Recommended for advanced users.
Complete
All program features will be installed. Requires the most disk space.
Back
Next
Cancel

7. This screen is your last chance to exit the installation procedure. Press **Install** to start the actual installation.


Covera Zone 2.1 Setup
Ready to install Covera Zone 2.1
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.
Back
Install
Cancel

Wait till the installation completes.



8. When you see this last screen, Covera Zone has been successfully installed on your machine.

You will be invited to activate your license when lauching **Covera Zone** for the first time, as described in the next section.

License Activation

Before using **Covera Zone**, you must first activate your license. You will have to go through the activation procedure only the first time you launch Covera Zone. To complete this quick procedure, you will need :

- a valid activation key. You should have received this key along with the **Covera Zone** installer, via e-mail, or other means. It is a string of text similar to this one: `A4JGY-PQYC4-CJC54-N27P5-MIDPS`.
- an Internet connection, so that the registration wizard can submit your activation data to Celtrio's server.
- to launch **Covera Zone** with administrator privileges.

To activate the license for the machine running **Covera Zone** follow this procedure:

1. **Launch Covera Zone**

   From the Windows **Start** menu:

   Start → **All Programs** → **Celtrio** → **Covera Zone 2.1**

> **Note**
> On Windows Vista right click on the **Covera Zone 2.1** item and then select **run as Administrator** from the contextual menu.

   The following activation wizard shows up when no valid license is found on the machine, which is the case when the application is launched for the first time. You may be asked to re-activate after significant modifications to the hardware configuration of your system.

2. **Activation key**

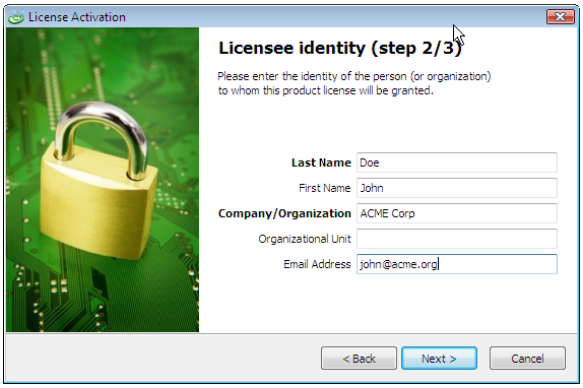
   Type the activation key in the appropriate field. You can also copy and paste to this field.

License Activation
License Activation (step 1/3)
You are about to activate the license for this product.
At the end of this procedure, your activation data
will be sent to our license server.
1. Make sure this machine is connected to the Internet
2. Paste (or type) your activation key
3. ...then press Next
Activation Key
AGJGY-PQYC4-CJC54-N27PS-MIDP
Next >
Cancel

   When the field is filled, you can press on the **Next** button.

3. **Licensee identity**

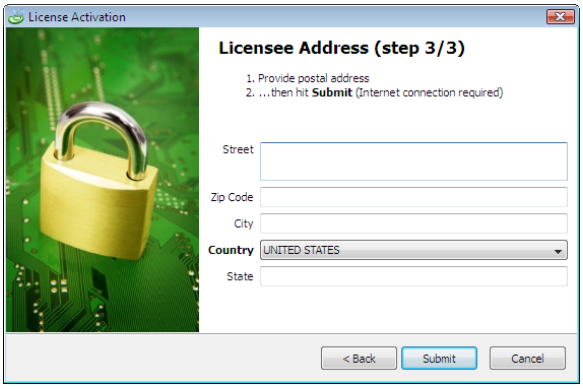
   Now, fill the licensee identity form. This should identify the person or organization to whom the license to use **Covera Zone** is granted.



   You can press the **Next** button only after the two mandatory fields, marked in bold, are filled.

4. **Licensee address**

   In this third and last step, provide the postal address of the licensee. The wizard will try to automatically detect your country from your operating system.



When you are ready to continue, press **Submit**. The activation wizard will send the activation data to Celtrio's server.

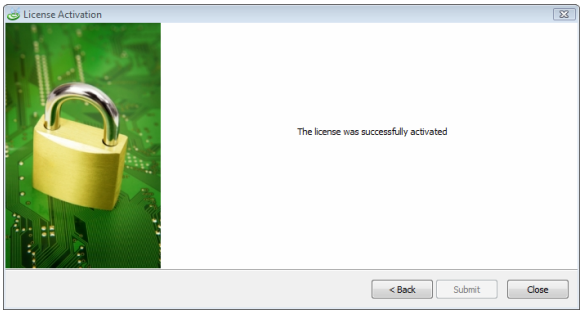
Note

The machine being activated must be able to send outgoing data on port 80 and receive the associated response.

- If you have a personal firewall running on your machine, make sure it will allow this traffic.
- If you are accessing the Internet through a corporate network, make sure that any firewall or proxy on the way will allow this traffic.

5. **Activation status**

   This last screen shows the response from the activation server. In case of an activation failure, have a look at the activation FAQ [114].



   If a direct connection to Celtrio's license server cannot be established, alternative activation methods via web browser or e-mail are proposed.

Once the activation has been completed, you can review the license data from the **About** dialog, accessible from the **Help** menu.

On-line support

You can obtain additional information and the latest version of this documentation from http://www.celtrio.com/support.

If you need further help about Covera Zone:

- send an e-mail to support@celtrio.com
- Registered customers will get priority support by submiting help request through their private account: http://www.celtrio.com/support/myaccount.php

Chapter 2. WLAN basics

Table of Contents

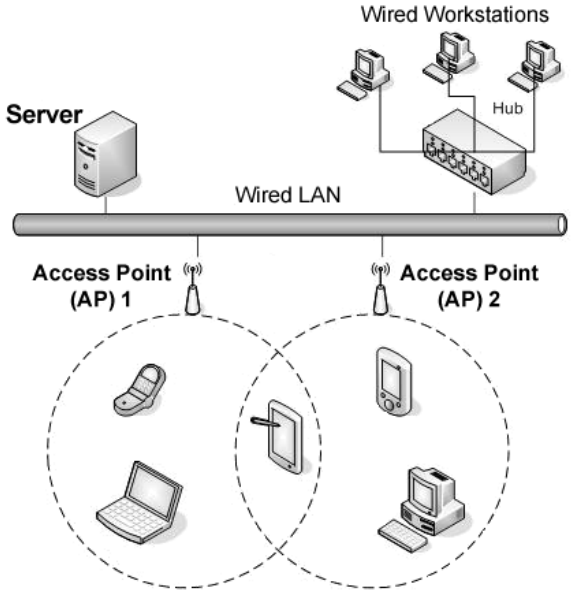
Network Architecture 9
Transmitter and receiver 10
Radiated power 10
Path loss 10
Effect of obstacles 11
Receiver Sensitivity 13
Factors impacting RSSI 14
Why Covera Zone? 14
Tips for surveys 15

Network Architecture

A Wireless Local Area Network (WLAN) is composed of one (or several) access point(s) and wireless clients, such as Wi-Fi enabled laptop computers, tablet PCs, PDAs or Wi-Fi phones. Access Points are usually connected to a wired Local Area Network (LAN) to allow communications between the wireless clients and the rest of the wired network. We will refer to access point and wireless clients as 802.11 or Wi-Fi devices. Wi-Fi devices use microwaves to communicate, at the following frequencies:

- 2.4GHz for 802.11 b/g/n compatible equipments
- 5GHz for 802.11 a and some 802.11n compatible equipments

802.11 a/b/g/n technologies used low power levels (<100mW). As a consequence, the coverage area of a given access point is limited to tenth of meters in a typical office space, or hundreds of meters in an outdoor set-up. To cover larger areas, it is necessary to add several access points to the network. For instance, the wireless network on the following diagram is made of two access points.



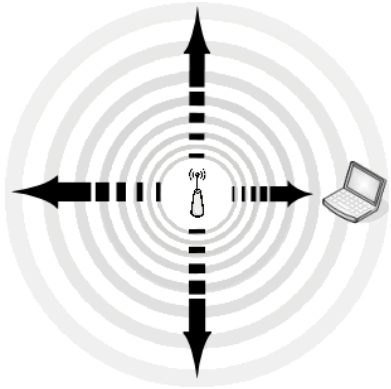
Transmitter and receiver

When data is sent from an access point to a wireless client, the access point is a transmitter and the client is a receiver. On the contrary, when data is sent from the wireless client to the access point, the wireless clients is the transmitter and the access point is the receiver. An access point or a wireless client can both transmit or receive, but not at the same time.

Transmitters and receivers use antennas to change radio signals in the air into electricity, or vice versa. Antennas send radio signals, receive signals, or both. Some equipment may use several antennas to improve the overall performance of the radio system.

Radiated power

Wi-Fi devices transmit data by radiating radio signal energy at a given power, referred to as *Equivalent Isotropically Radiated Power* or EIRP.



This output power can be attenuated by cables and connectors, or increased by amplifiers and high-gain antennas. A high-gain antenna do not actually increase the power but concentrate it to a certain direction of space. The more directional the antenna, the higher the gain and the EIRP in this direction. Typical WLAN devices use omnidirectional antennas that radiate the signal in all directions, hence providing only a modest gain in a given direction.

The actual EIRP varies with product, manufacturer and antenna used. Access points and clients on the same network may transmit at different power levels. Usually Access Points transmit at a higher EIRP than clients because they have no need to save on power, as they are permanently connected to a source of electrical power. In most countries the EIRP is subject to regulatory limits.

Path loss

When energy is radiated from the transmitter's antenna (EIRP), a wavefront propagates through the air and around obstacles encountered along the way. The signal loss on the path between the transmitter and the receiver is called *path loss*. In an ideal free space environment, radio waves would propagate from the access point to the wireless client without hitting any obstacles. In this case, the free space path loss would be due only to power lost as energy disperses into the air. This why the free space loss formula, given below, only depends on the distance d between the transmitter and the receiver (as well as the wave length #, and the gain Gr Gt of the receiving and transmitting antennas). The ratio between the power at the receiving end (Pr) to the power at the transmitting ends (Pt) is

$$\frac{P_r}{P_t} = G_r \cdot G_t \left(\frac{4\pi d}{\lambda} \right)^2$$

In this formula, power are expressed with Watts. However, radio engineers prefer to use a different unit called *decibel* to manipulate power levels and antenna gain. Decibels (noted dBm) are defined with the following formula:

$$P(dB_m) = 10 \cdot \log_{10} \left(\frac{P}{1mW} \right)$$

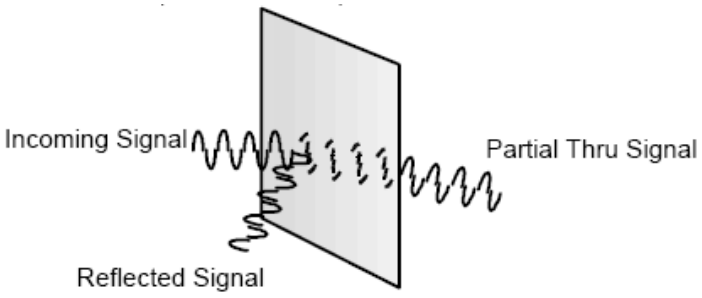
On this logarithmic scale, 1mW is equivalent to 0dBm. When the power (in mW) is divided by a factor of 10, then the decibel equivalent decreases by one unit. Using this logarithmic scale, the path loss formula shows that the signal strength (in dBm) decreases with the logarithm of the distance between both ends of the communication:

$$P_r(dB_m) = P_t(dB_m) + G_r(dB_m) + G_t(dB_m) - 20 \cdot \log_{10} \left(\frac{4\pi d}{\lambda} \right)$$

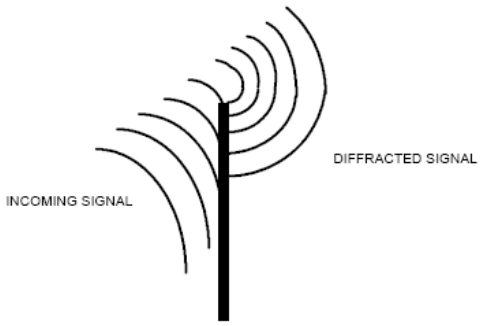
Effect of obstacles

We have seen that microwaves used by Wireless LANs propagate along straight lines from the transmitter to the receiver. This is the ideal case, in real environments, air and distance are not the only "obstacles" encountered by WLAN transmissions. Typical obstacles such as windows, doors, walls, desks, and even people will significantly attenuate WLAN transmission signal, but it can still be strong enough to maintain a link over tenths of meters, with only a near line-of-sight or even without line of sight at all, depending on the environment. This is due to the properties of radio waves that can be reflected, diffracted, or scattered by obstacles. Eventually the transmission reaches the receiver, attenuated by the combination of all these effects.

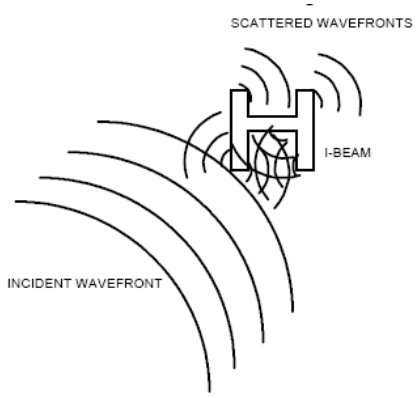
When the transmitted signal is striking a surface it will either be *absorbed*, *reflected*, or be a combination of both, depending on the obstacles and signal properties. Obstacles properties are the surfaces geometry, texture and material composition. Signal properties are the arriving incident angle, orientation, and wavelength.



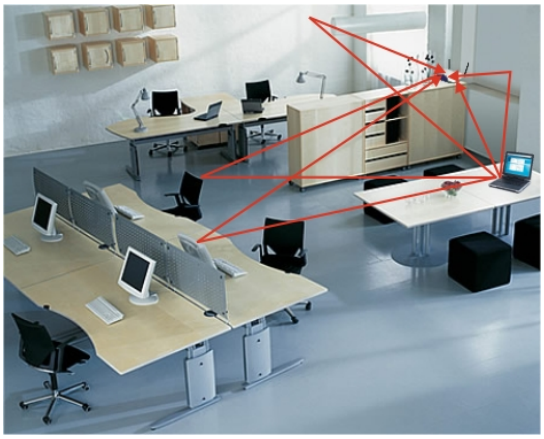
A *diffracted* wave front is formed when the transmitted signal is obstructed by sharp edges in the propagation path. Secondary waves are formed behind the obstructing body, even though there is no line of sight. Indoor environments contain many such edges and openings.



If there are many objects in the signal path, and the objects are small relative to the signal wavelength, then the propagated wavefront will break apart into many directions. The resultant signal will *scatter* in all directions adding to the constructive and destructive interference of the signal.



In indoor environments the wave front radiated from the transmitter antenna will experience many different transformations and different reflection paths as shown in the picture below. At the receiver antenna, the resulting signal will be the sum of propagation along *multiple paths*. Signals along different paths have traveled different distances and hence reach the receiver with different phases. This will create constructive and destructive interferences.



Receiver Sensitivity

When the transmitted signal eventually reaches the receiver, it may be so attenuated that the receiver cannot handle it, depending on the sensitivity threshold of the receiving device -- i.e., the minimum power required to handle arriving frames at a given link speed. Receive Sensitivity is a distinctive characteristic of a 802.11 device and will vary across different products.

Signal strength is measured on a logarithmic scale expressed in decibels. The higher the signal, the better the performance of the wireless network. At the client side, **Covera Zone** does not directly record the signal but an indicator provided by the wireless interface driver, called the *Received Signal Strength Indicator* or RSSI. On a typical WLAN, RSSI will range from -20 dBm (very close to the AP) to -95 dBm (away from the AP). The following table shows the sensitivity threshold for a typical 802.11 b/g network device. Assuming a 10 dBm margin to account for the inevitable RSSI fluctuations in the link budget, the current generation of 802.11b/g devices can maintain a wireless connection for a signal stronger than -84 dBm. However, a good connection will require at least -75dBm.

Signal Strengh (dBm)	Link Speed (Mbps)	Theoretical free space range (meter)	Theoretical free space range (feet)
-94	1	1543	5063
-93	2	1375	4513
-92	5.5	1226	4022
-86	6	614	2016
-86	9	614	2016
-90	11	974	3195
-86	12	614	2016
-86	18	614	2016
-84	24	488	1601
-80	36	308	1010
-75	48	173	568
-71	54	109	358

Given the above client sensitivity specification, we make the following assumptions to calculate the theoretical range of an access point:

- the access point transmits at EIRP = 100 mW = 20 dBm
- free space loss propagation, (i.e. no obstacles at all along the way)
- 10 dB margin in the link budget

As the client moves away from the access point, the signal decreases an the wireless client/access point will automatically switch to a lower but more robust link speed. The calculated ranges may seem very optimistic when compared it to real world ranges. The reason is that in real world deployments, obstacles do exist and even a few of them will severely impact the range.

Factors impacting RSSI

As we have seen in the previous sections, different propagation effects and equipment characteristics will impact the performance of a wireless LAN, hence the size and shape of the coverage area. We can group these parameters in three categories:

Access Point
- transmitted power
- receive sensitivity (for client to access point transmissions)
- antenna used (plus cable/connector losses if external antennas are used)

Environment
- Physical obstacles to the radio wave propagation
- Distance between the transmitter and the receiver
- Interferences from other access points/clients on your own network or from neighboring networks
- Radio interferences from non 802.11 sources

Client
- transmitted power (when the client is transmitting)
- sensitivity (for access point to client transmissions)
- antenna used
- orientation of the client's antenna relative to the access point's antenna

The performance of a wireless network will not only depend on the quality of the access points but also on the quality of the wireless clients. A given access point may exhibit good performance when used with high quality wireless clients. The exact same access point in the same environment may exhibit a lower performance when lower quality clients are used. The higher the sensitivity and the antenna gain at the client, the better. For instance most USB client sticks have a poor antenna (because the antenna must fit on the USB stick) when compared to laptops with an embedded 802.11 interface, usually mounted on larger surface behind the LCD screen.

Why Covera Zone?

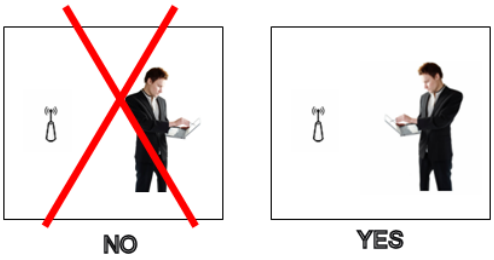
As we have seen in the previous sections, the performance of a wireless network depends on a number of factors, some of which are difficult or costly to model properly such as the propagation environment. This is the reason why verification (or audit) site surveys are necessary to validate that a newly installed wireless LAN performs as expected.

Covera Zone is such a post installation wireless site survey tool. It will assist you in auditing the actual coverage and performance of the wireless network under test. **Covera Zone** will allow you to make RSSI measurements from various places. This data is later processed to create visual coverage maps. **Covera Zone** will calculate a signal strength for locations you haven't visited during the site survey. This operation is called regression.

Tips for surveys

Temporary modifications to the propagation environment, like people walking in an office corridor, do impact RSSI measurements. When you walk around the network under test, your own body can create a screen between the access point and the wireless client running Covera Zone if you don't pay attention. To conduct repeatable site surveys, we recommend that you follow these rules:

- Conduct campaigns with a measurement terminal whose wireless device is similar to the devices used on the network. When different NICs are used on the network, make the measurements with the lowest specification device.
- The more measurements you take, the better the regression and the accuracy of the generated coverage map.
- FOR DRIVE TESTS: You should use an external antenna connected to the client. Ideally this antenna will be mounted on the roof of the car. It is recommended to set a step of at least 50 meters between automatic GPS survey points. If the GPS step is too small, a new wireless scan cannot be completed between each step and you will record the same wireless network data on multiple GPS positions.
- FOR WALK TESTS: You should always face the closest access point when making a survey point. This will ensure that the measurements for the closest AP will not be biased by the body screen effect.



- Try to make site survey campaigns while the area is quiet (this is to avoid temporary obstacles like people walking in the corridors)
- For each survey point, make sure the measurement terminal always have the same vertical orientation. As most Access Points have vertical antennas, this will ensure that the same relative orientation to the access point is maintained for all survey points.

Chapter 3. Getting started

Table of Contents

Creating a project 16
Adding a campaign to a project 17
Calibrating a map 20
Controlling the map display 22
Survey Points 24
- Adding a survey point 25
- Content of a Survey Point 25
- Moving a survey point 26
- Renaming a survey point 27
- Updating a Survey Point 28
- Deleting survey points 29

Views 29
- Calculating a view 30
- Adding a view 31

Generating reports 33

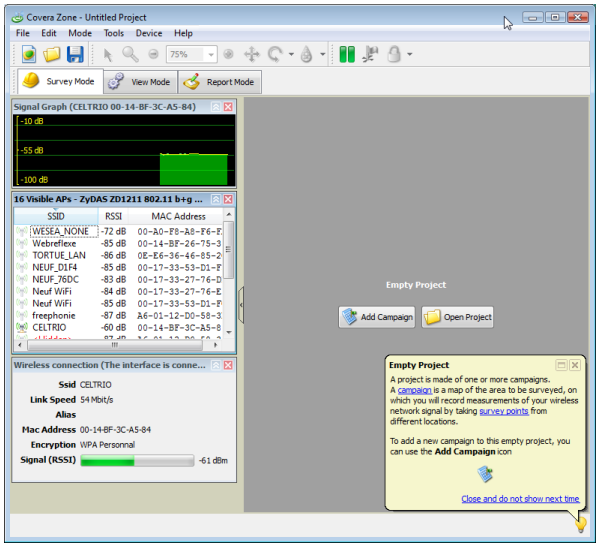
Creating a project

A **Covera Zone** project is made of all the data recorded during a wireless site survey, as well as all the parameters required to generate and display views and reports based on this data. A project is organized in campaigns. It should contain at least one campaign to be useful, but can hold any number of campaigns. A project is saved in a file with a .cvr extension.

Note

On Windows XP, you must run Covera Zone from an account with administrator privileges.

By default, **Covera Zone** will open on an empty project when you launch it. In this case, the map area is grey and contains only two shortcut buttons to open an existing project file or to add a new campaign to this empty project.


Covera Zone - Untitled Project
File Edit Mode Tools Device Help
Survey Mode
View Mode
Report Mode
Signal Graph (CELTRIO 00-14-BF-3C-A5-84)
-10 dB
-55 dB
-100 dB
16 Visible APs - ZyDAS ZD1211 802.11 b+g ...
SSID RSSI MAC Address
WESEA_NONE -72 dB 00-A0-F8-A8-F6-F
Webreflexe -85 dB 00-14-BF-26-75-3
TORTUE_LAN -86 dB 0E-E6-36-46-85-2
NEUF_D1F4 -85 dB 00-17-33-53-D1-F
NEUF_76DC -83 dB 00-17-33-27-76-D
Neuf WiFi -84 dB 00-17-33-27-76-E
Neuf WiFi -85 dB 00-17-33-53-D1-F
freephonie -87 dB A6-01-12-D0-58-3
CELTRIO -60 dB 00-14-BF-3C-A5-8
Wireless connection (The interface is conne...
Ssid CELTRIO
Link Speed 54 Mbit/s
Alias
Mac Address 00-14-BF-3C-A5-84
Encryption WPA Personnal
Signal (RSSI) -61 dBm
Empty Project
Add Campaign
Open Project
Empty Project
A project is made of one or more campaigns.
A campaign is a map of the area to be surveyed, on which you will record measurements of your wireless network signal by taking survey points from different locations.
To add a new campaign to this empty project, you can use the Add Campaign icon
Close and do not show next time

You can create a new empty project by clicking on the project icon in the tool bar. This will open a new project window.

- Alternatively, you can also create a new empty project from the menu bar **File** → **New project**.

At this stage, you have an empty project. If a wireless device is detected on your machine, you can see information about the wireless network you are connected to, as well as the **Visible APs** in the neighborhood.

Adding a campaign to a project

Before you can add measurements to your project, you must create a campaign that will contain your measurements and a background map. A campaign is a map of the area under test, on top of which you will position wireless network measurements. A campaign will contain measurement data associated with a position. We call this assocation a survey point. You can think of a campaign as a container for a background map and survey points.

A project can contain one or more campaigns. For instance, if you want to survey two different floors in the same building, you could add two campaigns to your project, with a different floor plan for each campaign.

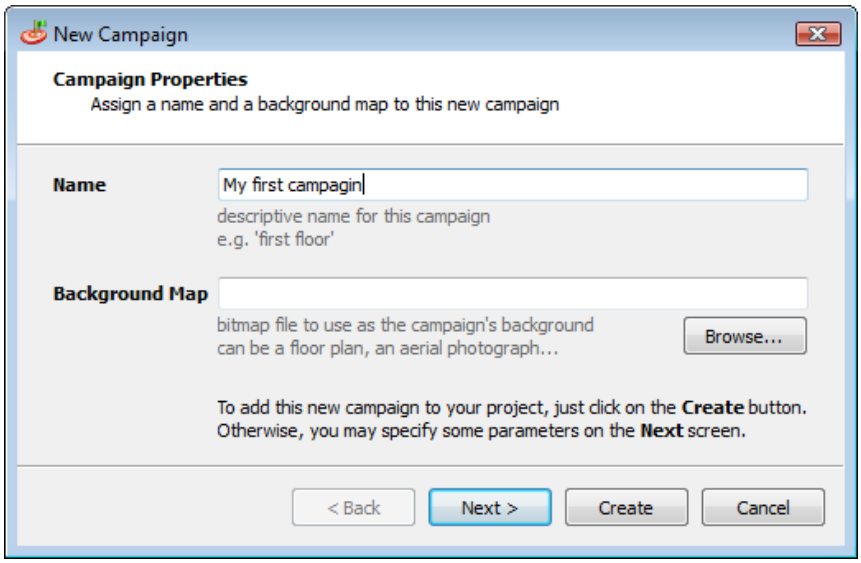
To add a campaign to an empty project follow these steps:

1. Make sure you are in survey mode by clicking the **Survey Mode** tab.

   From the menu bar, select **Mode** → **Survey Mode** → **Add Campaign** .

   - You can also click on the **Add Campaign** in the map area of an empty project.

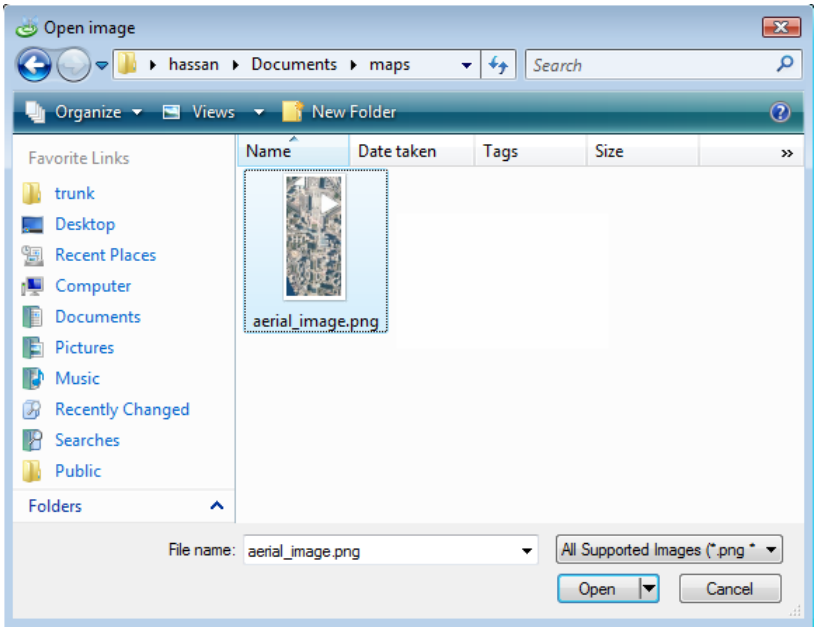
2. The campaign wizard will show up. You can set your own name for this new campaign, instead of the default one proposed by the wizard. For instance, type **`My first campaign`** into the **Name** field.


New Campaign
Campaign Properties
Assign a name and a background map to this new campaign
Name
My first campagin
descriptive name for this campaign
e.g. 'first floor'
Background Map
bitmap file to use as the campaign's background
can be a floor plan, an aerial photograph...
Browse...
To add this new campaign to your project, just click on the Create button.
Otherwise, you may specify some parameters on the Next screen.
< Back
Next >
Create
Cancel

   This new name will only be recorded when the campaign is actually created. You can modify it anytime before pressing the **Create** button.

3. The background map is the main visual element of a campaign. You should use an image of the area to survey with enough details to easily pin point locations. This could be a floor plan for indoor surveys, or an aerial photography for outdoor surveys.

   a. Click on the **Browse** button. The file selection window will show-up.

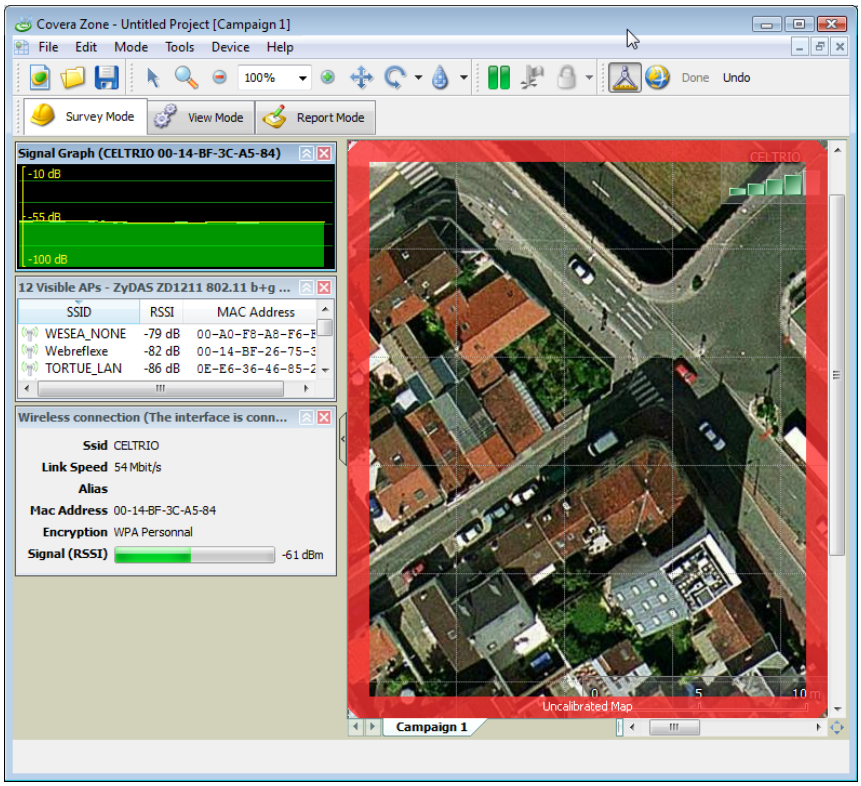


   b. Select a bitmap image file on the disk. Most bitmap image formats are supported (PNG, GIF, JPG, TIF, BMP).

   c. After a bitmap file is selected, press **Open**.

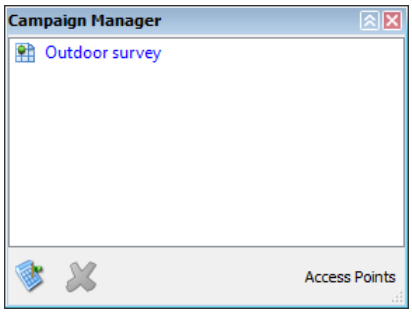
4. We have set a name and a background map for this campaign. To actually create the campaign and add it to the project, just press **Create**. If you do not want to create a campaign now, you can cancel the operation by closing the wizard or pressing **Cancel**.

   The selected image will now be displayed in the map area, with a red ribbon around. The red ribbon indicates that the map is not calibrated. For more information, see the section called “Calibrating a map” [20].



5. You can check that the campaign has been added to the current project. Notice that a tabulation has been added below the map area with the name of your campagin. You can also see a campaign has been added to project with the **Campaign Manager** tool.

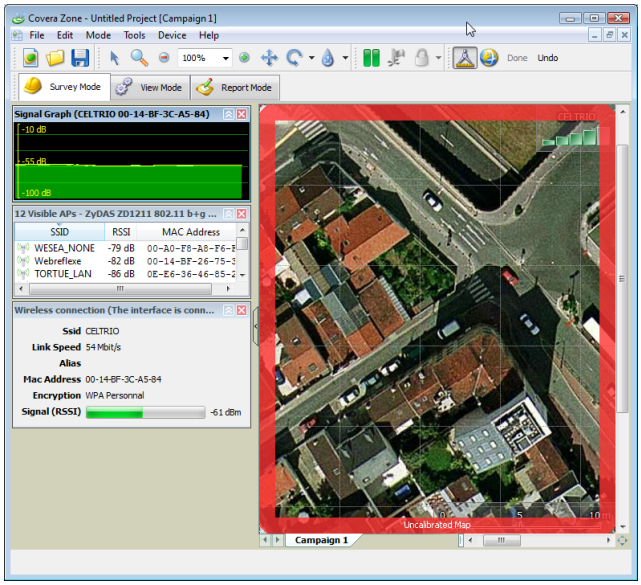
   In the menu bar, select **Tools** → **Campaign Manager**. This will ensure that the **Campaign Manager** window is visible on the screen.



   The list of campaigns contained in the current project is displayed. In our example, there is only one: **My first campaign**.

Calibrating a map

When you import a background map to a project, **Covera Zone** does not know its scale. This is why any background map must be calibrated before it can be used. There is a red ribbon displayed all around the map area as long as the map is not calibrated yet.

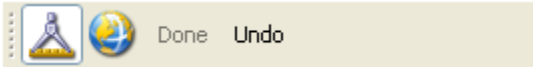


There are two different methods to calibrate a map:

Scaling — The scale of the map is determined by providing the actual distance between two reference points. This method typically used on floor plans.

Georeferencing — The map is fully georeferenced by providing the absolute position (latitude/longitude) of two reference points. This method is typically used for aerial photographs and is compulsory if you want to use a GPS receiver.

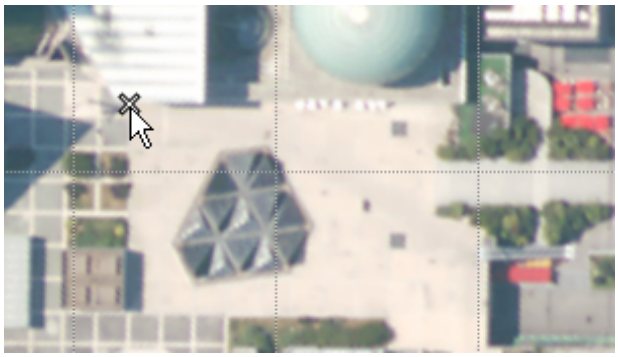
Each of these two methods is represented with an icon in the calibration tool bar. This tool bar is visible only when the map is not yet calibrated, or is being re-calibrated.



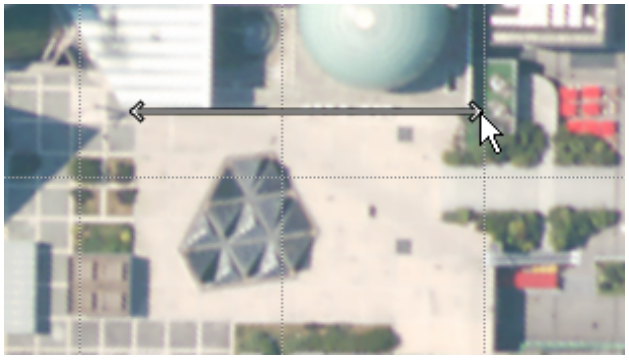
For the purpose of this tutorial, we are going to use the simplest calibration method: scaling. You will need to know the distance between two reference points on your map (for instance, the length of a corridor). If you don't have any reference distance, you can use an approximate value, since the map can be re-calibrated later.

1. Select the **Scaling Map** icon from the calibration tool bar. This is the default calibration tool, so it may be selected already.

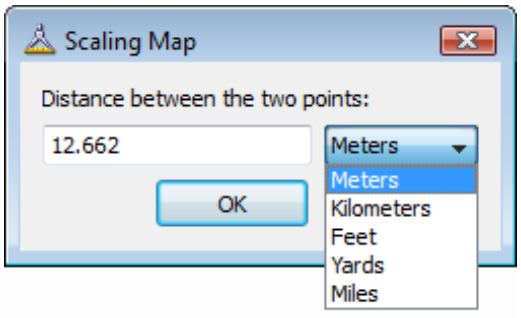
2. On the map, click on the position of the first reference point with the left mouse button. A cross symbol will be displayed on this first reference position.



3. Move the pointer to the second reference point while pressing the left mouse button. This will draw a line between the two reference points.



4. The **Scaling Map** dialog box will show up after you released the mouse over the second refrence point. Now enter the known **Distance between the two points**. You can choose the length unit in the menu.



5. In the **Scaling Map** dialog, press **OK** to validate the distance between your two reference points. At the bottom of the map area, the message on the red ribbon will change to **Map is scaled**.

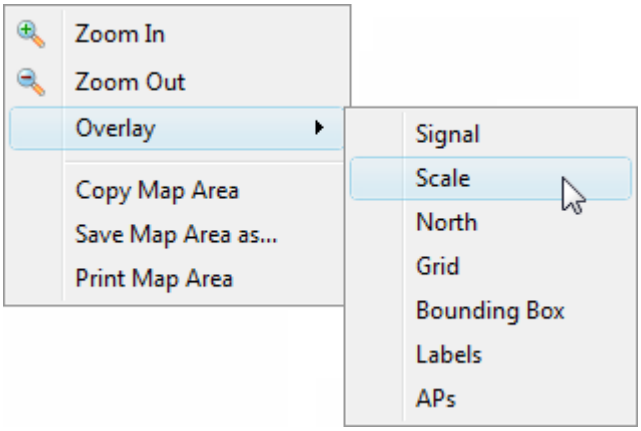
   - If you have made a mistake and want to specify different reference points, just click on a new position and start again.

6. Exit the calibration mode by pressing **Done** on the red ribbon or in the calibration tool bar.

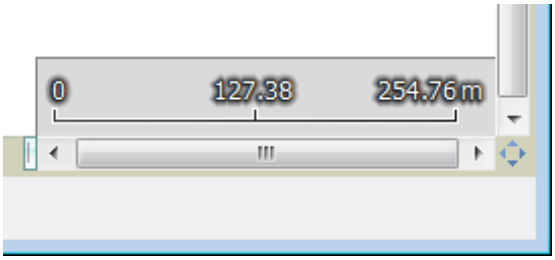
> **Note**
> Until the map is calibrated, it is not possible to take survey points or use any functionality beyond calibration and basic map control operations.

7. The map is now scaled. Covera Zone will display a scale legend box overlay.

   a. Click with the right mouse button over the map area. Make sure the **Scale** item is selected.



   b. You should see a scale box at the bottom right corner of the map area. If you want to move the scale box to a different position, just grab it with the mouse to move it around the map area.



Controlling the map display

Covera Zone offers many features to control what is displayed in the map area, and how it is displayed. For instance, you can reveal details by zooming in or moving around the map. The following procedure will show you some of the useful tools available to control the map display.

1. To see more details on your map, you can magnify it by increasing the zoom factor.

   a. In the tool bar, select the **Zoom** tool.

   b. Use the mouse wheel to increase the zoom factor. If you have a mouse without a wheel, click the left mouse button to increase the zoom factor.

2. You can also move around the map.

   a. In the tool bar, select the **Move** tool.

   When you move the cursor over the map area it turns into an opened hand icon.

   b. Press the left mouse button over the area you want to grab. The cursor turns into a closed hand.

   c. While pressing, move the closed hand and the map in any direction.

   When you release the mouse, the map will keep its new position inside the map area.

3. When the zoom factor is important, it is easy to get lost in the magnified map. In this case, you can display a navigation map that shows an overview of the whole map. We call it the navigation miniature.

   a. At the bottom right of the main window, press on the navigation miniature icon.

   The navigation miniature is visible as long as you keep pressing on the mouse.

   b. While pressing, move the cursor over the navigation miniature. Notice the black frame over the miniature: it shows the portion of the whole map which is currently visible inside the map area. The size of the black frame depends on the zoom factor, the higher the zoom factor the smaller the frame. Additionnally, when you move the black frame over the miniature, notice that your position is modified accordingly in the main map area.

   The size of the navigation miniature can be defined in the the section called “User interface options” [88].

For more information, see also the section called “Map tool bar” [45].

Survey Points

Survey points are a key concept in **Covera Zone**. Think of a survey point, or point, as the association of the following elements:

- a position
- measurements (typically *RSSI*) acquired while the client is standing at this position
- meta information (time, name)

Survey Points are taken manually by clicking on a position on the map, or automatically with a GPS receiver that will provide the positionning data. See the section called “How to set-up a GPS receiver?”[100] for more information. **Covera Zone** uses survey point data to calculate coverage views.

Adding a survey point

Once you have created a campaign and calibrated a map, you can start adding survey points to the current campaign.

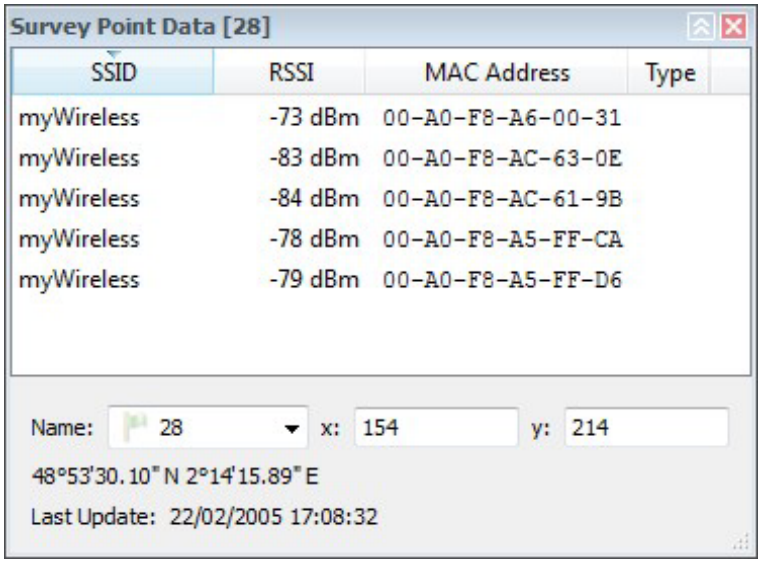
1. Select the **Add Survey Points** tool in the toolbar.

2. If you move the cursor over the map area, it turns into a target symbol.

3. Click on the map to add a survey point. For each click, **Covera Zone** records network measurements and associates the results to the position pinpointed on the map. Every point is automatically labeled with a unique number.

Content of a Survey Point

To view the data recorded for a survey point, just double click on the point. The **Survey Point Data** tool appears on the screen. You can resize it so that all the columns and lines fit the window.



Name

Covera Zone automatically assigns a number to each new point. The name is displayed on the map as a label below every points. You can modifiy this field and set your own name.

Last Update	Time of the last update for this survey point. If the point was never updated, then it is the creation time.
x , y	Pixel coordinates of the point on the map. You can manually edit these values and see the point moving accordingly on the map.

When the map is geocalibrated, the latitude and longitude of the point are also shown.

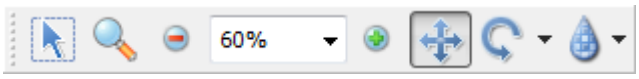
Many measurements are acquired for each survey point, but by default only a few columns are displayed. For more details, see the section called “Survey Point Data ” [84]

MAC address	unique identifier of the Access Point (or the ad-hoc station).
SSID	name of the wireless network.
RSSI	received radio signal strength as reported by the wireless NIC driver software.
Type	Type of network A = 802.11a, B = 802.11b, G = 802.11g (determined from Max Rate).

Layer 2 (RSSI, MAC,...) data is instantly available for all the visible stations in the air, and is recorded for every survey point. **Covera Zone** can also make layer 3 (IP level) measurements. Since these are longer to complete, they are not enabled by default. See the section called “IP layer performance” [57] for more information.

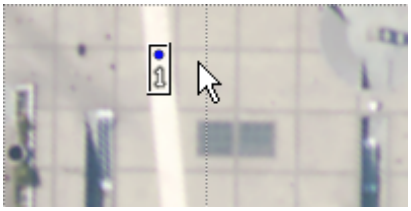
Moving a survey point

1. Click on the **Selection** icon in the tool bar.



2. Move the cursor over a survey point. Notice that the point turns red.

3. Click on the point while it is red. A white frame appears around the survey point to show that it is selected.

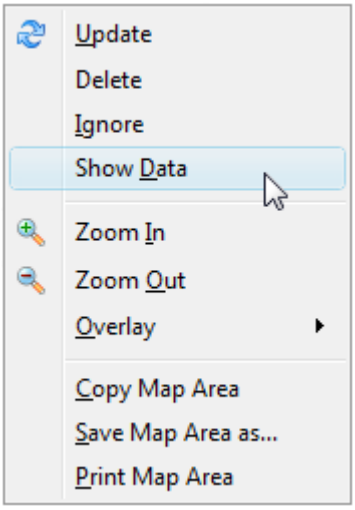


4. Click on the selected point and keep pressing while you move it. When you release the mouse, the survey point will keep its new position. All the measurements attached to the point when it was created remain unchanged. This feature is useful to adjust a position.

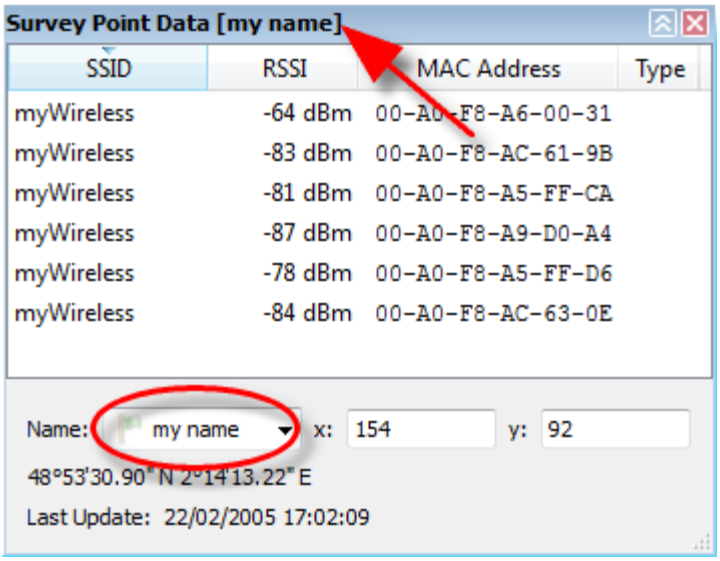
Renaming a survey point

Covera Zone automatically assigns a number to every new survey point and uses this number as a name for the point. You can assign a more meaningfull name.

1. Right click on a survey point to display the contextual menu.

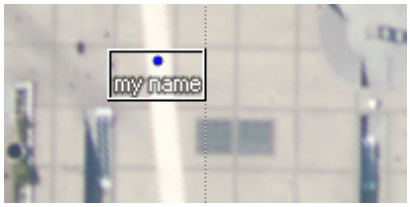


2. In this contextual menu, select **Show Data**. A window, similar to this one below, appears.



3. In the **Name** field you can enter your own text. For instance, type **`my name`**.

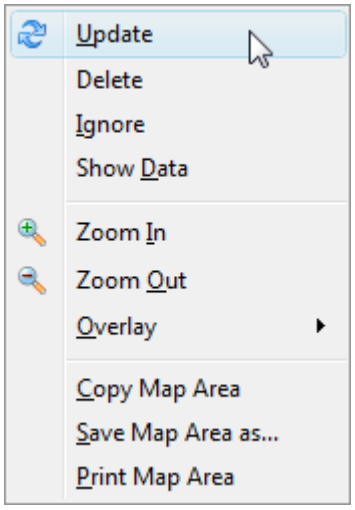
4. Press **Enter** to validate the netry. The new name is now used to label the point on the map.



Updating a Survey Point

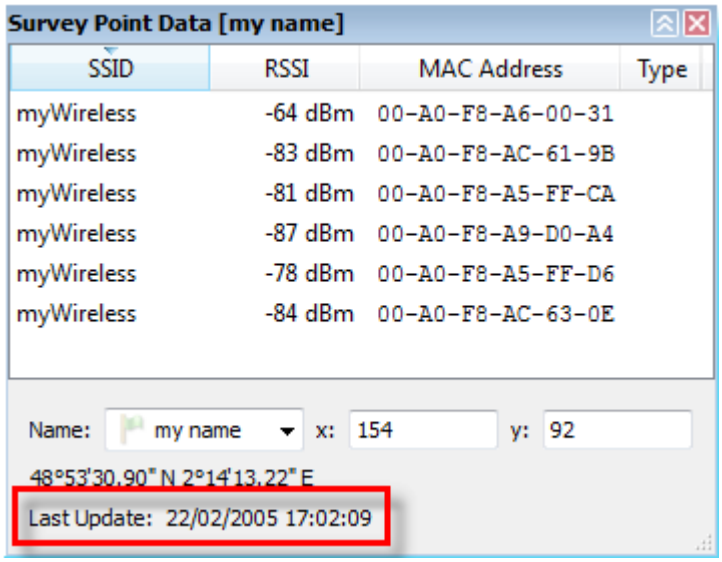
The measurements attached to a survey point are automatically acquired when it is first created. However, you can update an existing point to refresh the measurements. In this case, the original measurements are replaced with new ones, acquired while the point is being updated.

1. Right click on the point you want to update to display the contextual menu.



2. Select **Update** in this contextual menu. Wireless network measurements are acquired.

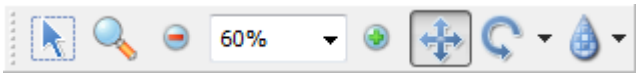
3. The **Last Update** time shows that the point has been updated.



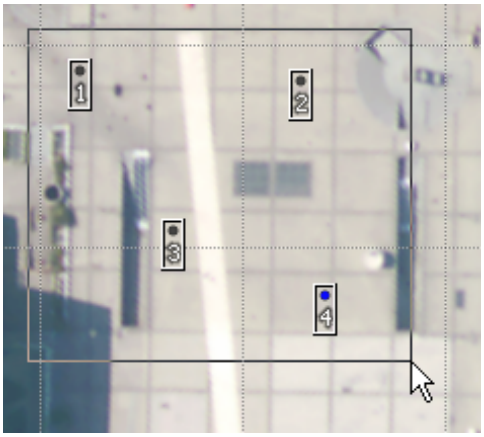
Deleting survey points

Covera Zone allows you to delete a group of survey points in a single operation.

1. Click on the **Selection** tool in the tool bar.

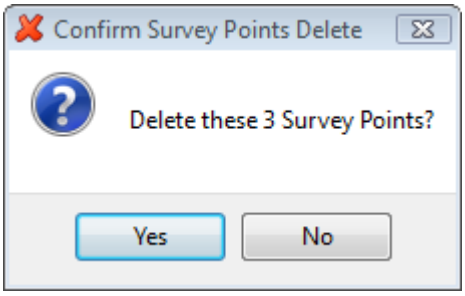


2. Select the survey points to delete by drawing a selection rectangle around them.



   - You can also select several survey points by pressing the **Ctrl** key while selecting individual points with the mouse.

3. Press the **Delete** key. A confirmation dialog will show up.



   Alternatively, you can also delete selected points from:

   - the contextual **Menu**.
   - the **Edit** menu.

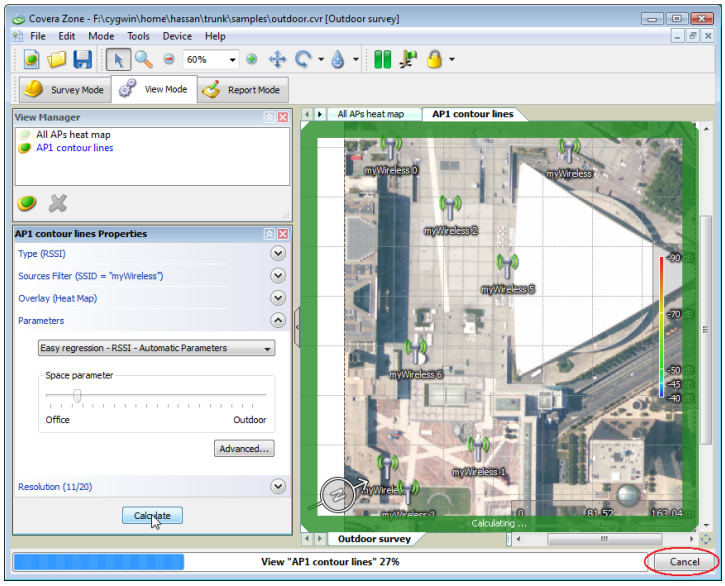
4. Click on **Yes** in the confirmation box.

Views

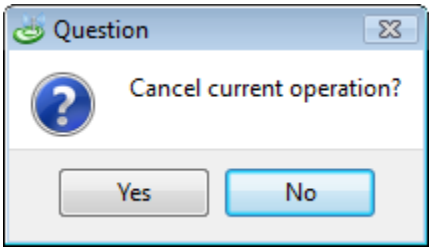
Covera Zone allows you to visualize site survey data by creating one or more views. Views are calculated by applying a regression algorithm to the survey points data. After the calculations, a heat map or a filled contour plot is displayed on top of the background map. This allows you to visualize the actual coverage of a wireless network.

Calculating a view

To see what a view looks like, you can open one of the sample files. For instance, open the `outdoor.cvr` file located in the `Samples` folder. Covera Zone will start calculating the view when you open this file.



Notice the green ribbon around the map area. It means that the view must be calculated before it canbe displayed. You can stop the calculations by pressing the **Cancel** button at the bottom-right corner of the screen.

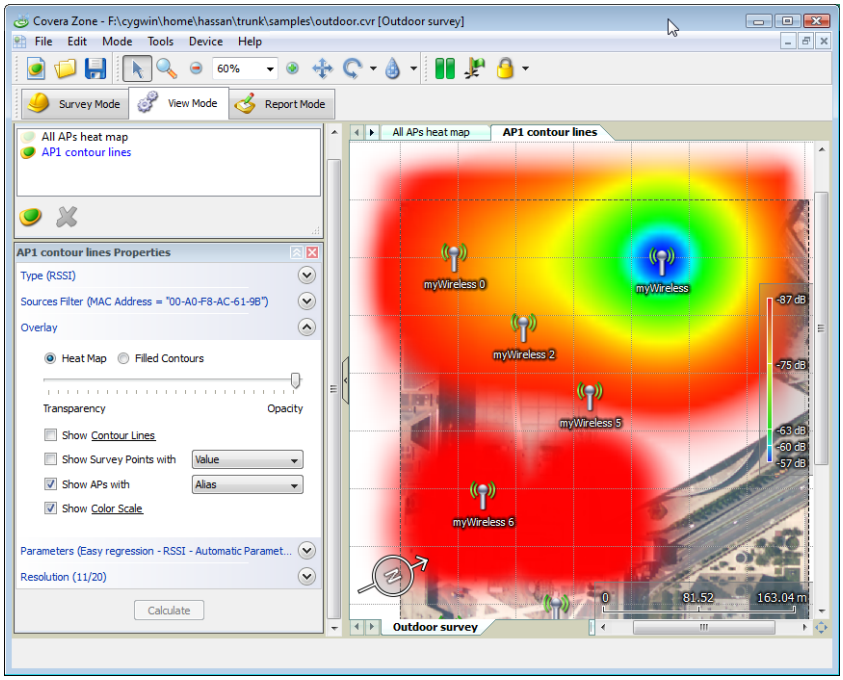


Yes Cancel the calculation in progess.

Yes to All A project may contain severak views. This will Cancel all the calculation for all the views.

No Continue.

After the calculation is completed, you should see a heat map view like this one.



When a project contains several views, you can decide which view to display with the tab bar, just above the map area. In the dock area, you will see a tool called **View Properties**. With this tool you can edit all the properties of the current view.

View properties are sorted into four sections. In the **Source APs** section, you define a filter to which acess point(s) is (are) selected to make up this view. In this example, only the access points broadcasting a **SSID** set to **`myWireless`** are considered. A regression is calculated for each of these access points, then the maximum value out of these individual regressions is kept as the final result for every pixel on the map.

A view can also represent a single acess point when a simple condition on a **Mac Address** is defined in the **Source APs** filter. In this case, a single regression is calculated.

Adding a view

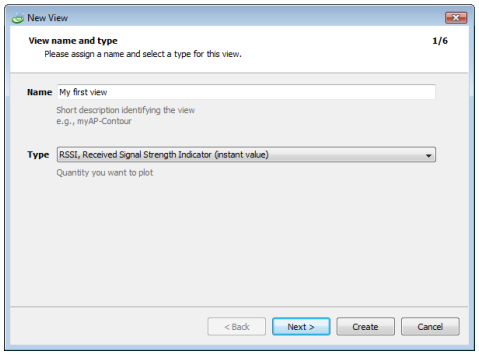
A project contain campaigns, each campaign can contain one or more views. To add a new view to the current campaign, follow this procedure.

1. Make sure your are operating in view mode by clicking on the **View** mode selection tab, above the map area.

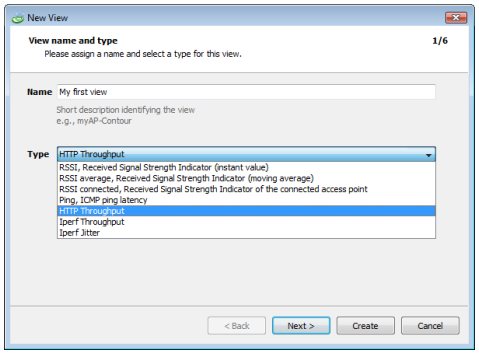
2. In the **View Manager**, click on the **Add View** incon.

   You can also launch the wizard from the menu bar, **Mode** → **Add View**.

3. The first step of the wizard shows up. In this dialog, you can set a name for the view. For instance, enter **`my first view`** in the **Name** field. This name must be unique inside a given campaign.



4. Quanties that may be used for the regression calculations are listed in the **Type** drop down list. For instance, select **RSSI** and press **Next**.

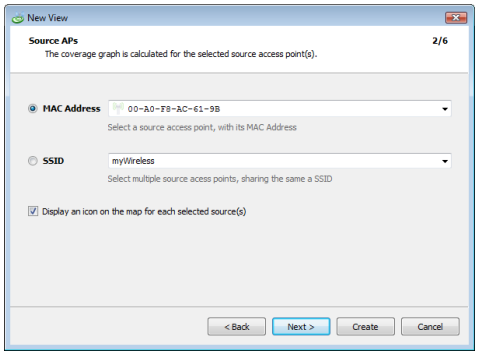


Press **Next** to move on to the next step.

Warning

If you select **HTTP throughput** as view type (or any other type based on optional measurements), you must have acquired the corresponding measurements during the survey, otherwise you will obtain an empty view. For more information, see the section called “IP layer performance” [57].

5. On this second step, you have to specify which source access point(s) are to be considered for this view. For instance, select a **MAC address** from the drop down list. This list is based on the recorded data. It will be empty if the campagin countains no survey points.


New View
Source APs
2/6
The coverage graph is calculated for the selected source access point(s).
MAC Address
00-A0-F8-AC-61-9B
Select a source access point, with its MAC Address
SSID
myWireless
Select multiple source acess points, sharing the same a SSID
Display an icon on the map for each selected source(s)
< Back
Next >
Create
Cancel

6. Press **OK** to create the view. There are additional steps in the view wizard, but default values will be used for the other parameters. For more information, see the section called “View Wizard”[47] To launch the calculations and render this view, press the **Calculate** button.

Generating reports

Covera Zone allows you to generate reports based on site survey data and views. The fololwing output formats are supported:

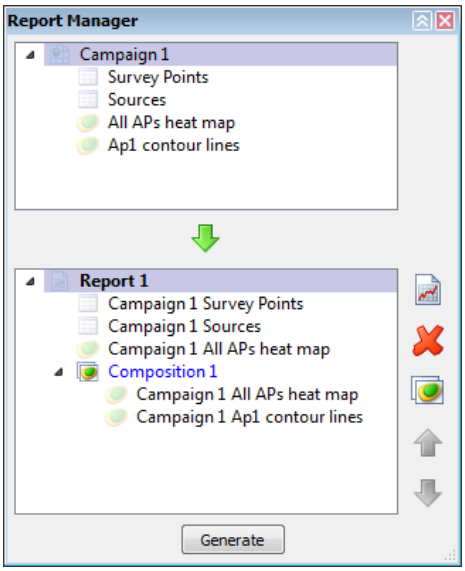
- HTML, for display in Web browsers (simple static HTML and interactive dynamic HTML).
- Rich Text Format (RTF), for use in Microsoft Word or Open Office Writer.
- KML, for display in Google Earth.

Note

Google Earth is a virtual globe program. It maps the earth by the superimposition of satellite images and aerial photographs over a 3D globe. **Covera Zone** can export georeferenced views as Google Earth layers. You can download Google Earth from http://earth.google.com/.

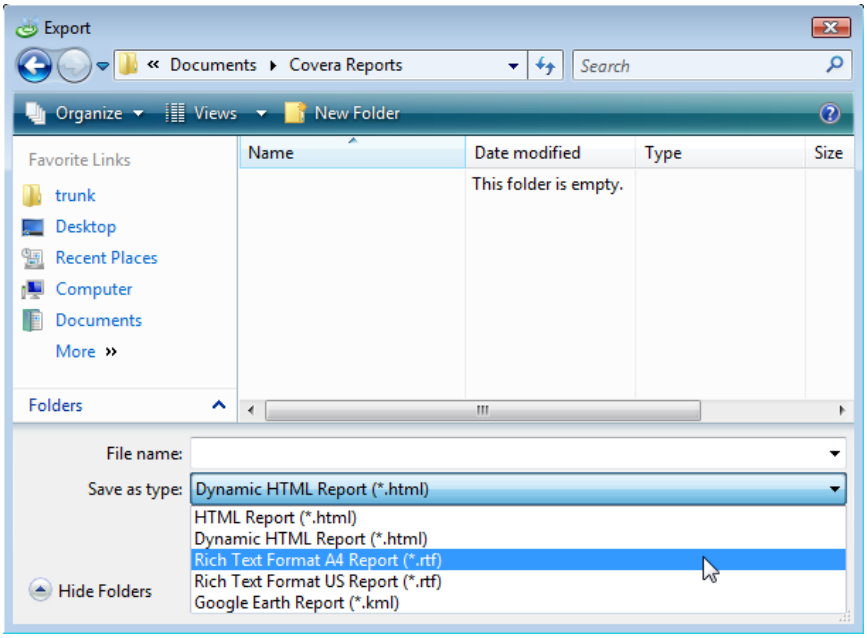
To generate a report from one of the sample files provided follow this procedure:

1. Open `outdoor.cvr`.
   a. Click on **Open** icon in the tool bar.
   b. In the dialog box, pick-up a project file from the installation folder, for instance: `C:\Program Files\Celtrio\Covera Zone 2.1\outdoor.cvr` and press **Open**.
   c. When the file opens, Covera Zone will automatically start calculating the views. Wait till it is completed.
2. After the calculation is completed, switch to report mode by clicking on the **Report mode** tab. In the **Report Manager** tool, you can see that this project already contains a report named **Report 1**.



3. Select **Report 1** and click on the **Generate** button.

4. The **Export** dialog box will show up.

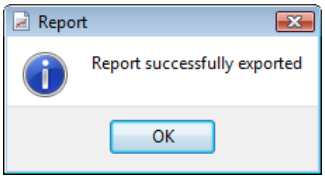


   a. Provide a **File name** for the output report file, for instance `first_project_files`.

   b. Select **Html Report (*.html)** in the **Save as type** drop down menu.

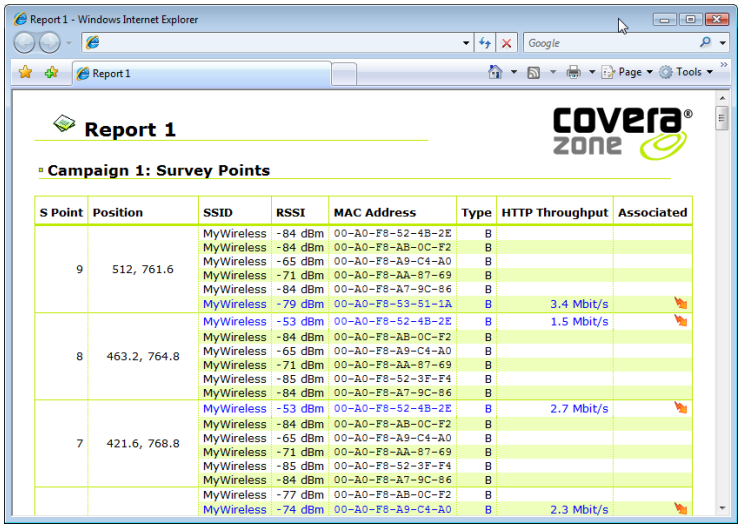
   c. Click on the **Save** button.

5. Wait while the report is being generated. This m ay take some time since high resolution images of the views have to be generated. Eventually, the following dialog will pop up when the HTML file and the associated ressources have been written to the disk.

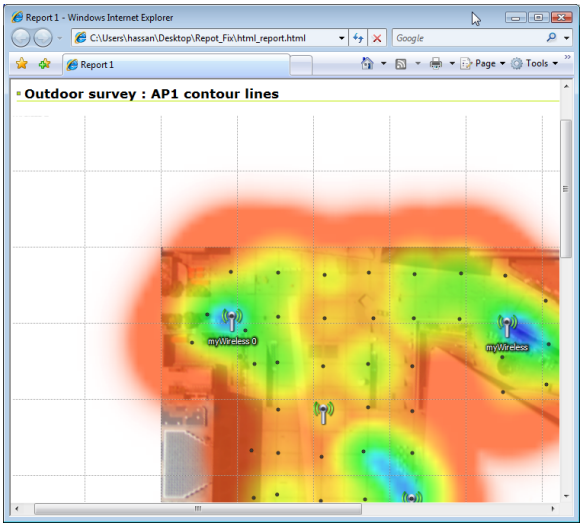


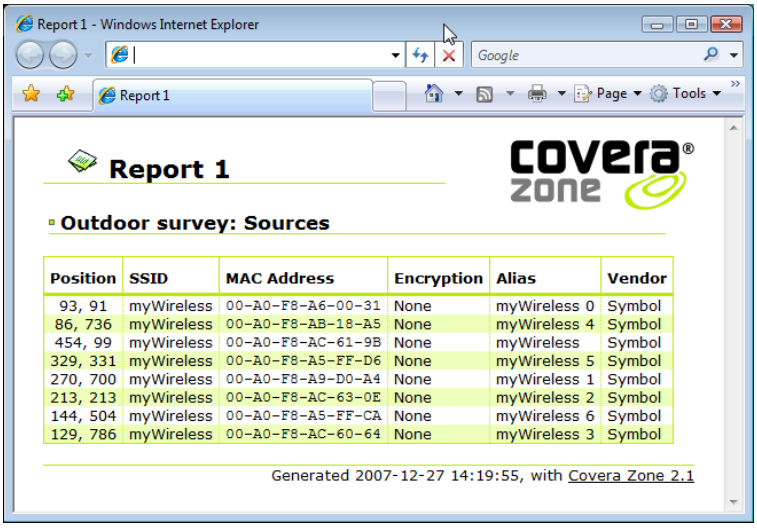
   A folder named after the report filename, in our example `first_project_files`, is created. It contains all the graphical resources of the HTML document.

6. Double click on the first_report.html file to open the HTML report in the Web brower configured on your system.



S Point	Position	SSID	RSSI	MAC Address	Type	HTTP Throughput	Associated
9	512, 761.6	MyWireless	-84 dBm	00-A0-F8-52-4B-2E	B		
		MyWireless	-84 dBm	00-A0-F8-AB-0C-F2	B		
		MyWireless	-65 dBm	00-A0-F8-A9-C4-A0	B		
		MyWireless	-71 dBm	00-A0-F8-AA-87-69	B		
		MyWireless	-84 dBm	00-A0-F8-A7-9C-86	B		
		MyWireless	-79 dBm	00-A0-F8-53-51-1A	B	3.4 Mbit/s	
8	463.2, 764.8	MyWireless	-53 dBm	00-A0-F8-52-4B-2E	B	1.5 Mbit/s	
		MyWireless	-84 dBm	00-A0-F8-AB-0C-F2	B		
		MyWireless	-65 dBm	00-A0-F8-A9-C4-A0	B		
		MyWireless	-71 dBm	00-A0-F8-AA-87-69	B		
		MyWireless	-85 dBm	00-A0-F8-52-3F-F4	B		
		MyWireless	-84 dBm	00-A0-F8-A7-9C-86	B		
7	421.6, 768.8	MyWireless	-53 dBm	00-A0-F8-52-4B-2E	B	2.7 Mbit/s	
		MyWireless	-84 dBm	00-A0-F8-AB-0C-F2	B		
		MyWireless	-65 dBm	00-A0-F8-A9-C4-A0	B		
		MyWireless	-71 dBm	00-A0-F8-AA-87-69	B		
		MyWireless	-85 dBm	00-A0-F8-52-3F-F4	B		
		MyWireless	-84 dBm	00-A0-F8-A7-9C-86	B		
		MyWireless	-77 dBm	00-A0-F8-AB-0C-F2	B		
		MyWireless	-74 dBm	00-A0-F8-A9-C4-A0	B	2.3 Mbit/s	

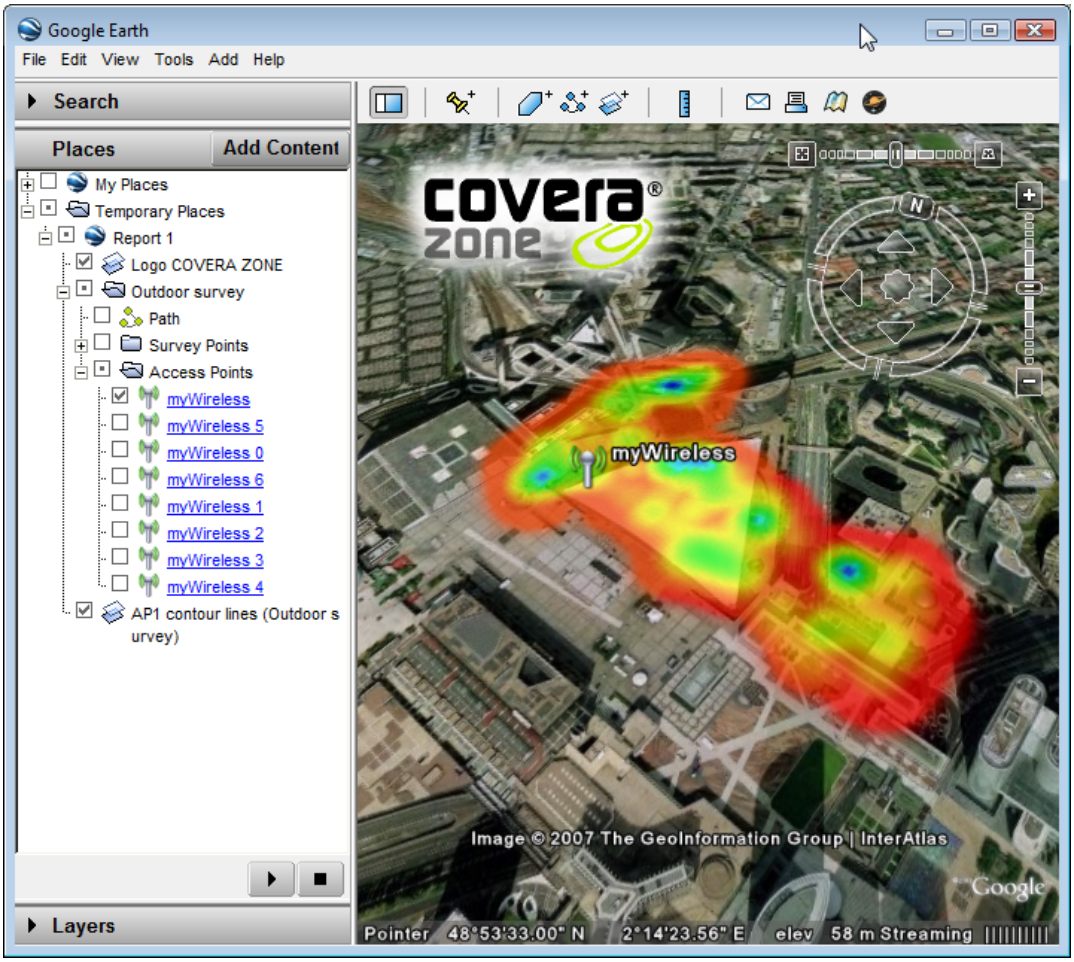




Position	SSID	MAC Address	Encryption	Alias	Vendor
93, 91	myWireless	00-A0-F8-A6-00-31	None	myWireless 0	Symbol
86, 736	myWireless	00-A0-F8-AB-18-A5	None	myWireless 4	Symbol
454, 99	myWireless	00-A0-F8-AC-61-9B	None	myWireless	Symbol
329, 331	myWireless	00-A0-F8-A5-FF-D6	None	myWireless 5	Symbol
270, 700	myWireless	00-A0-F8-A9-D0-A4	None	myWireless 1	Symbol
213, 213	myWireless	00-A0-F8-AC-63-0E	None	myWireless 2	Symbol
144, 504	myWireless	00-A0-F8-A5-FF-CA	None	myWireless 6	Symbol
129, 786	myWireless	00-A0-F8-AC-60-64	None	myWireless 3	Symbol

Generated 2007-12-27 14:19:55, with Covera Zone 2.1

7. To generate a Google Earth version on this report, follow the same procedure but select **Google Earth Report (*.kml)** as the export format. When you double click on the KML file, you should see something like this:



Note

If you want to move the .kml and .html file on your disk, do not forget to also move the associated `_files` folder.

Chapter 4. User Interface Reference

Table of Contents

Overview 38
Modes 39
Dock Area 39
    Dockable Tools 40
Map area 41
Menu 42
    File menu 42
    Edit Menu 42
    Mode menu 43
    Tools menu 44
    Device menu 44
    Help menu 44
Keyboard shortcuts 44
Map tool bar 45
Survey tool bar 45
Campaign Wizard 46
View Wizard 47
Find dialog 50
Survey mode tools 51
    Signal graph 52
    Campaign manager 52
    Visible APs 53
    Wireless Connection 54
    Chase AP 55
    GPS 56
    IP layer performance 57
View mode tools 62
    View Manager 62
    View Properties 63
    Heat Map Color Scale 69
    Contour Lines 74
Report mode tools 79
    Report Manager 79
    Composition 81
Common tools 83
    Survey Point Data 84
    Access Point Data 85
Options 86
    General options 87
    User interface options 88
    Gps receiver options 88
    Survey options 89
    Sound options 90

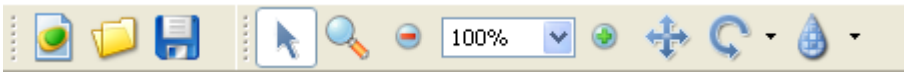
Overview

Covera Zone's workspace is divided in three main areas:

- At the top of the main window, you will see the *menu and tool bars*. Each tool bar can be individually moved or hidden. A right click over a tool bar will show the associated contextual menu.

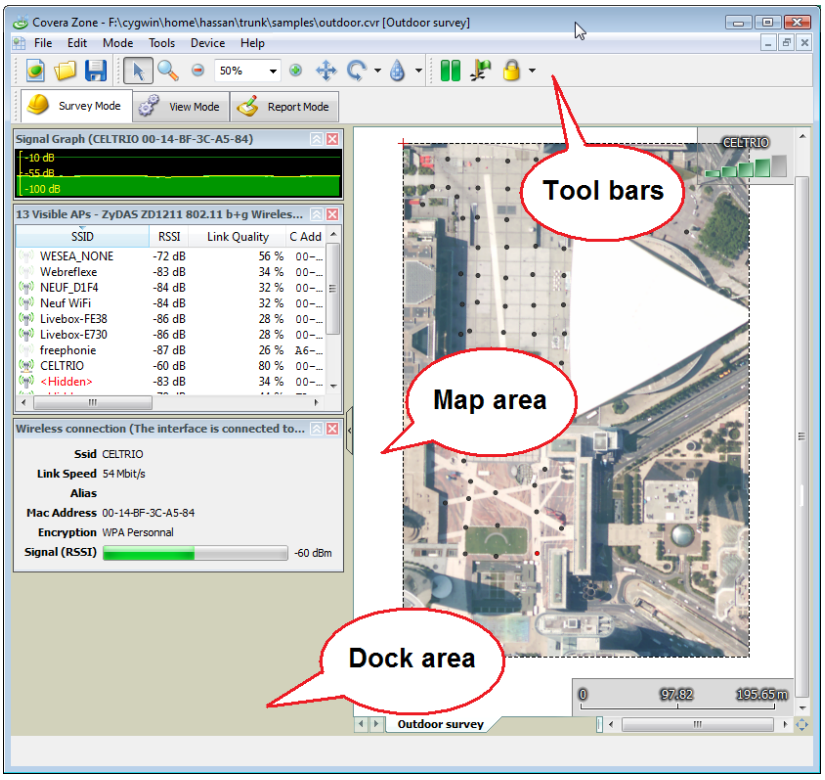
Menu bar

Main tool bar



Mode bar

- The *Dock area* can hold dockable tools, like the **Wireless Connection** window tool in the screenshot shown below. Tools can be docked or undocked to and from the dock area: just grab the tool with its title bar, and move it into the target dock area while pressing the mouse. Only the left dock area is visible by default, but you can dock tools at the top/bottom/left/right of the map area.



Workspace

- The *Map Area* is where the background map , views, stations and survey points are displayed (not represented here). Graphical overlays can be dispayed over the map area, like a scale legend at the bottom right corner.

Modes

Covera Zone can operate in three different modes, depending which phase of a wireless survey project you are into.

- In **Survey** mode, you typically walk around the area under test and take measurements, from different positions. All this data is stored in a campaign.
- In **View** mode, you calculate views based on the campaign data, to analyse and visualyse the coverage of a wireless network.
- In **Report** mode, you can create reports from campaign data and views. A report is snapshot of the state of your wireless network, published as a HTML, RTF or KML document.

In a given mode, only the relevant dockable tools are accessible. To see a complete list of all the dockable tools available for the current mode, open the **Tools** menu. When you switch to a different mode, the content of this menu will change.

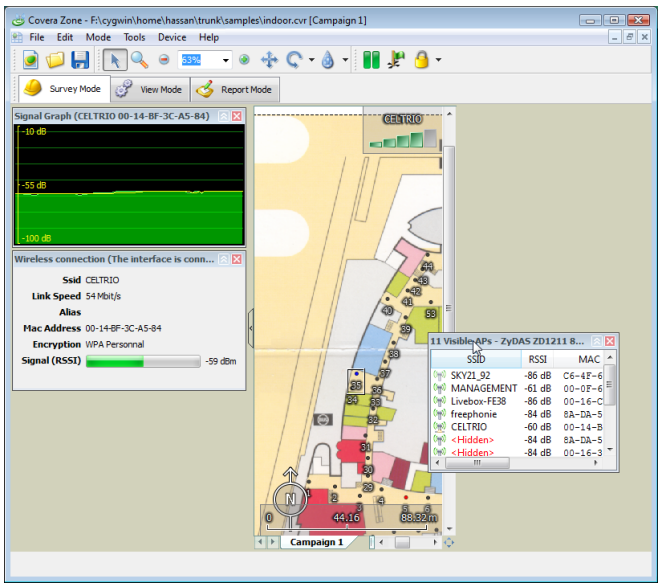
Note

Certain operations are not possible when the application is not in the appropriate mode. For instance, when using **Covera Zone** in survey mode, you can only access the tools useful for a wireless site survey, like the radio signal strength indicator or the information about the current wireless connection.

You can switch between modes with the **Modes** menu, the mode toolbar shown above or using keyboard shortcuts. For more information on this last option, see the section called “Keyboard shortcuts” [44].

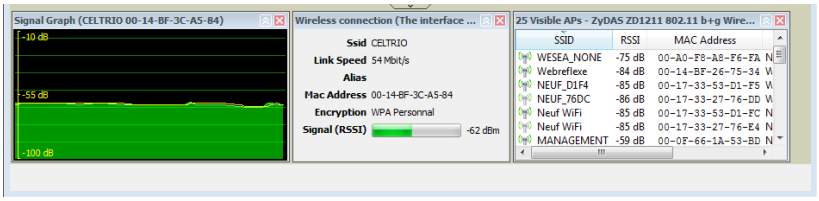
Dock Area

You can undock a tool by grabbing its title bar and move it out of the dock area while pressing the mouse as shown below.

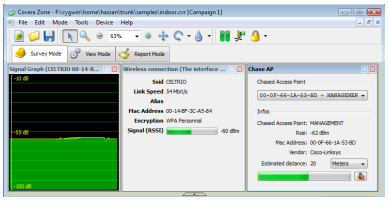


To completly show/hide a dock area, use the handlers shown below.

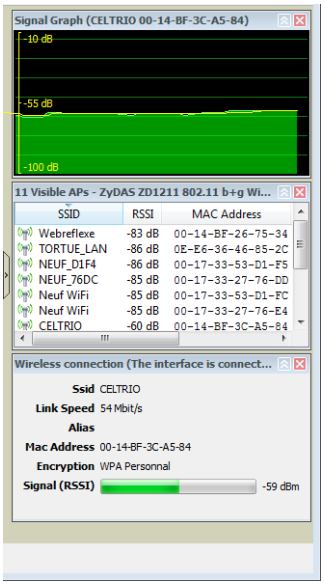
Different possible configurations of the dock areas are shown below.



Tools in the bottom dock areas



Dock area above the map area.



Dock area at the right of the map area.

You can reset the workspace at any time, and get all the dockable tools back to their default positions by choosing **Tools** → **Reset Workspace** from the menu bar.

Dockable Tools

To dock/undock a tool, just grab its title bar and moved it in/out the dock area while pressing the mouse.

You can also move a tool over the workspace and avoid docking, by grabbing its title bar and clicking the right mouse button. Alternatively, you can use the left mouse and the **Ctrl** key at the same time.

All the dockable tools share the same action icons in the title bar:

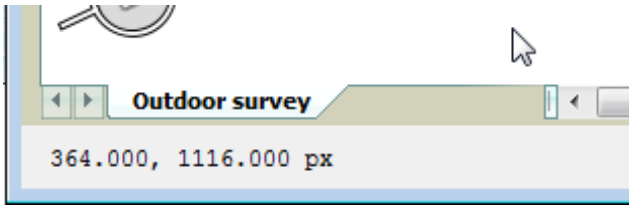
- expand or collapse the dockable tool
- Close the tool.You can always re-open a closed dockable tools by selecting it directly from the **Tools** menu.

Map area

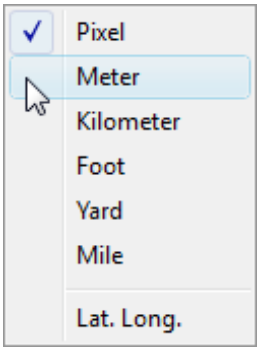
The background map and the regression views are displayed inside the map area. Scroll bars around the map can be used to navigate in large maps.

The navigation icon located on the lower right corner of the map ( ) is used to show a miniature of the background map. This is useful to simplify the navigation over large maps, as shown below.

When you move the mouse over the map, notice that the corresponding coordinates are displayed in the status bar.



If you click on the coordinates in the status bar, you will have the option to select the coordinates unit. You can choose to display latitude and longitude coordinates when the campaign is georeferenced. For more information, see the section called “How to georeference a map?” [109]



Menu

File menu

File → New Project Windows (**Ctrl+N**)	Open a new window and create an empty project.
File → Open (**Ctrl+O**)	Open the file selection dialog to select an existing project file.
File → Recent Projects	Show the list of recently opened projects.
File → Close project	Close the current project without closing the window.
File → Save (**Ctrl+S**)	Save the project to a file on the disk.
File → Save As...	Save the project to a file on the disk, under the filename you've specified.
File → Export Data	Export raw data to various formats (XML file, CSV file, Google Earth KML file).
File → Save Map as Image	Save a bitmap image of the map. This bitmap can be larger than the map area visible on the screen.
File → Page Setup	Open the Page setup dialog to specify parameters before printing.
File → Print Map (**Ctrl+P**)	Print the map, using the parameters specified in Page Setup.
File → Exit (**Alt+F4**)	Close Covera Zone and exit.

Edit Menu

Edit → Cut (**Ctrl+X**)	Copy the selected elements to the application clip board and delete them from the current campaign.
Edit → Copy (**Ctrl+C**)	Copy the selected elements to the application clip board.
Edit → Paste (**Ctrl+P**)	Paste the elements in the application clip board (points) to the current campaign.
Edit → Paste as new campaign	Create a new campaign with the elements in the application clip board (map and points).
Edit → Delete (**Del**)	Delete the selected elements.
Edit → Select All (**Ctrl+A**)	Select all survey points and stations on the map.
Edit → Invert Selection (**Ctrl+I**)	Invert the selection of survey points.
Edit → Ignore point	Set a survey point ignore flag. Ignored points are not used by the regression algorithm when calculating views.

Edit → Update point	Update the measurements for the active survey point (represented with a blue dot).
Edit → Find (Ctrl+F)	Open the **Find** dialog to locate survey points or stations on the map.

Mode menu

The mode menu allows you to switch from one mode to the other, and to select actions specific to a given mode.

Survey mode actions

Mode → Survey Mode	Switch to Survey Mode (disabled if the application is already in Survey Mode).
Mode → Add campaign	Add a campaign to the current project.
Mode → Delete campaign	Delete the current campaign.
Mode → Recalibrate	Recalibrate the background map.
Mode → Set Background Image	Change the background map.
Mode → Lock points → Lock all points	None of the survey points can be moved.
Mode → Lock points → Lock only GPS points	None of the points acquired automatically with a GPS receiver can be moved.
Mode → Circle GPS survey points	Display a circle around GPS survey points. Manual survey points will be represented normally.

View mode actions

Mode → View Mode	Switch to View Mode (disabled if the application is already in View Mode).
Mode → Add View	Add a view.
Mode → Delete view	Delete the selected view.
Mode → Calculate View	Launch the calculations for the current view.
Mode → Clear View	Clear the current view.

Report mode actions

Mode → Report Mode	Switch to Report Mode (disabled if the application is already in Report Mode).

Mode → Add Report	Add a report to the current project.
Mode → Delete Report	Delete the current report.
Mode → Add Composition	Add a *composition* to the current report.
Mode → Generate Report	Generate the current report and save the result to a file.

Tools menu

The **Tools** menu contains the list of all available dockable windows. This list will change depending on the current mode of the application (Survey, View or Report mode)

Tools → Survey Point Data	Open/close Survey Point Data window.
Tools → Access Point Data	Open/close Access Point Data window.
Tools → Reset Workspace	Reset the workspace (i.e. reset dockable windows, reset dockable areas, toolbars, ...).
Tools → Options...	Open the Options dialog.

Device menu

This menu contains the list of wireless *NIC* detected on your machine.

Device → Properties	Open the device properties dialog.

Help menu

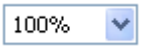
Help → Use Guide	Open Covera Zone on-line help.
Help → About Covera Zone	Show version and legal information about Covera Zone. Access license management.
Help → Check for updates	Show check for updates dialog.
Help → Send feedback	Open web browser on the on-line feeback form.

Keyboard shortcuts

F1	Launch the on-line help.
ALT	Underline the shortcut keys in the menu.
F5	Calculate a view.
ALT+S	Switch to survey mode.
ALT+V	Switch to view mode.
ALT+R	Switch to report mode.

Map tool bar

The map tool bar provides tools to control how the map is displayed in the map area.

	Selection tool	Allows you to select survey points or access points.
	Zoom tool	When this tool is active, the pointer is changed into a magnifying glass. - the mouse wheel increase/decrease the zoom factor - the left mouse button increase the zoom factor
 	Zoom + / Zoom -	(+) increase the zoom factor (-) decrease the zoom factor
	**Zoom factor**	From this menu you can directly choose a zoom factor. When set to 100%, one pixel on the screen represents exactly one pixel on the map.
	Move Tool	Move left/down/up/down inside the map area.
	Turn around Tool	Turn the map around the center of the map area. If you use the mouse's wheel button, the map will turn around the pointer position in the map area. If you click the icon, a sub menu allows to **Reset** the rotation angle.
	Transparency	When you click on entryis icon, a slider will show up to allow you to set the level of transparency of the entire map.

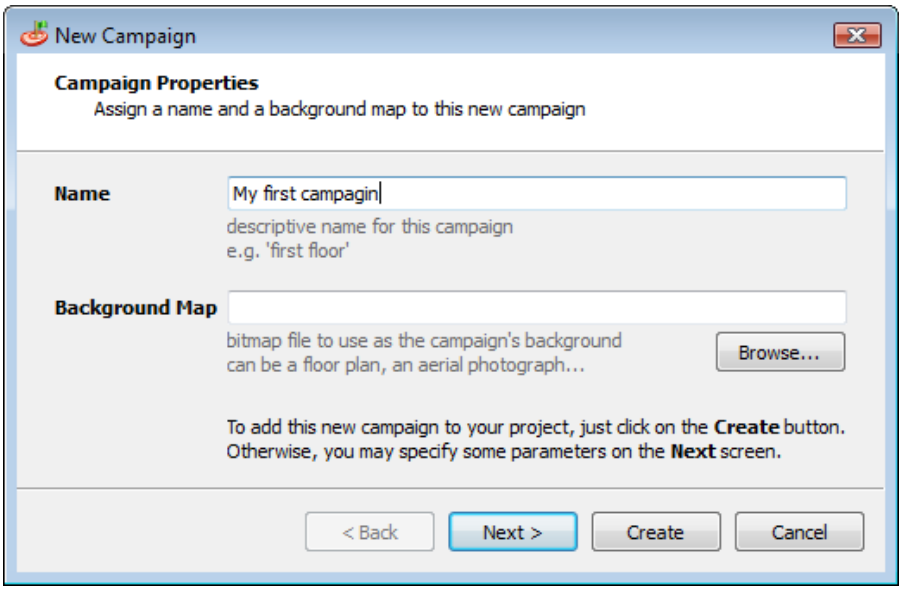
Survey tool bar

The survey tool bar provides useful tools when performing a wireless site survey.

	Start Scanning	Resume scanning operation on the current wireless network interface.
	Pause Scanning	Pause airwaves scanning on the current wireless network interface.
	Add Survey Points	When this tool is selected, clicking over the map area will create a new survey point.
		Pressing on the lock icon will display the lock menu. **Lock all points** to forbid moving any survey point. **Lock only GPS points** to forbid moving survey points with a GPS position.

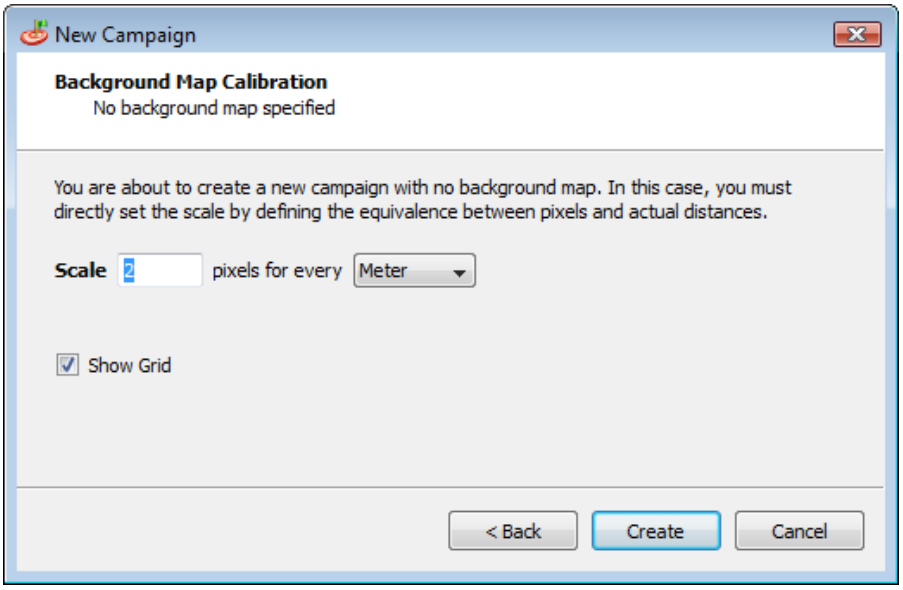
Campaign Wizard

When you add a new campaign to a Covera Zone project, the following wizard will show up on the screen.

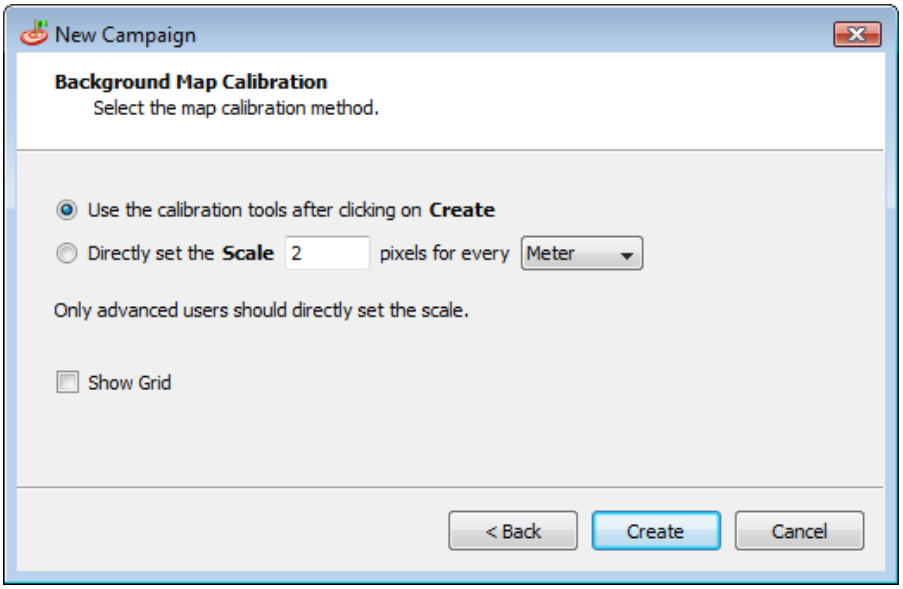

New Campaign
Campaign Properties
Assign a name and a background map to this new campaign
Name
My first campagin
descriptive name for this campaign
e.g. 'first floor'
Background Map
bitmap file to use as the campaign's background
can be a floor plan, an aerial photograph...
Browse...
To add this new campaign to your project, just click on the Create button.
Otherwise, you may specify some parameters on the Next screen.
< Back
Next >
Create
Cancel

You can replace the proposed **Name** for the campaign with a personalized one. The **Browse** button allows you to pick-up a bitmap file to use as the background **Map** for this campaign. When you click on the **Create** button after selecting a bitmap file, you will jump directly to the calibration.

You can click on **Create** without setting an image for the map. In this case, **Covera Zone** will choose a default scale. You can modifiy this default scale in the second step of the wizard shown below.


New Campaign
Background Map Calibration
No background map specified
You are about to create a new campaign with no background map. In this case, you must directly set the scale by defining the equivalence between pixels and actual distances.
Scale
2
pixels for every
Meter
Show Grid
< Back
Create
Cancel

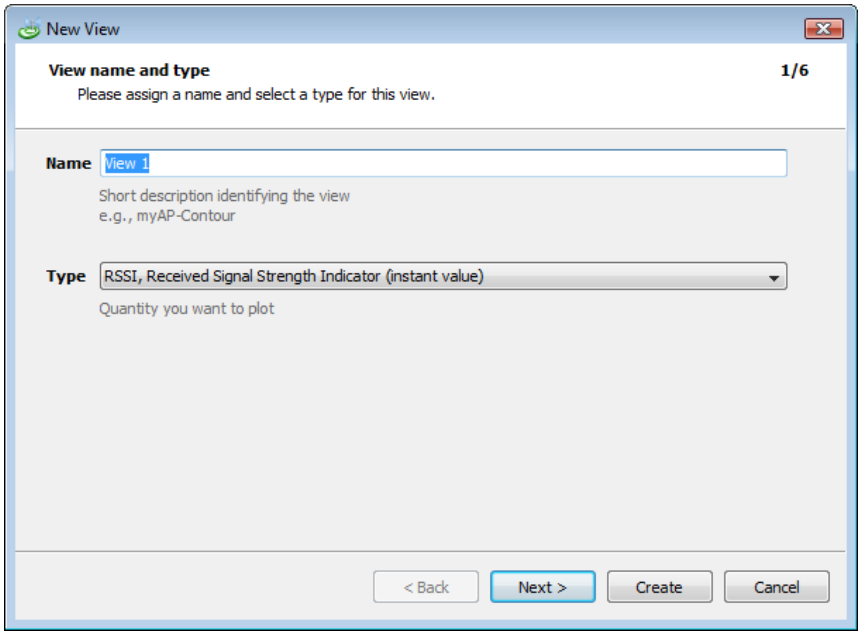
After setting a path to an image, you can manually define the number of pixel per meters instead of relying on the calibration tools. Check **Directly set the scale** and press **Create**. The image will be precalibrated with this scale.


New Campaign
Background Map Calibration
Select the map calibration method.
Use the calibration tools after clicking on Create
Directly set the Scale 2 pixels for every Meter
Only advanced users should directly set the scale.
Show Grid
< Back
Create
Cancel

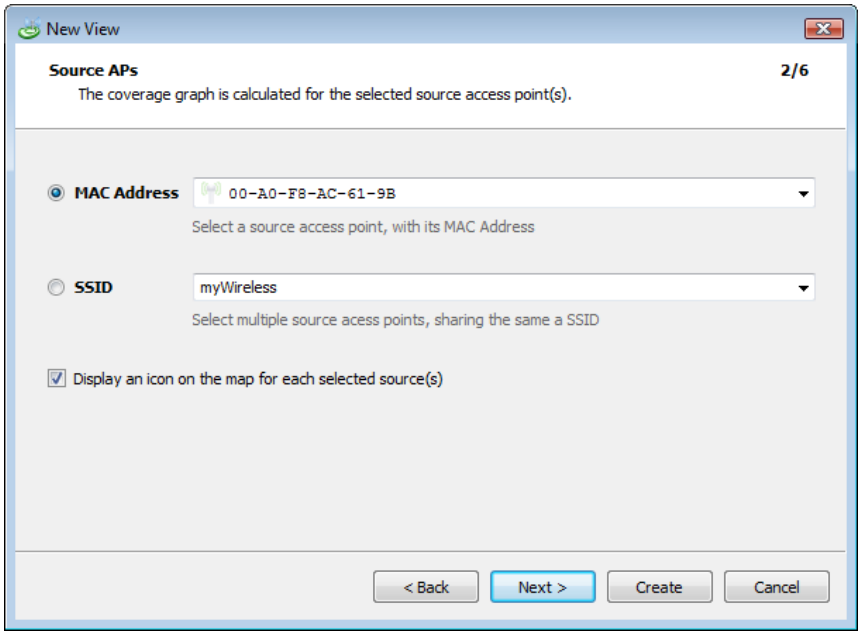
View Wizard

When you add a new view to a project, the following wizard will show up to help you define the parameters for your view. You can press on the **Create** button anytime in the wizard to create your view. Default values for the not yet personalized parameters will be used.

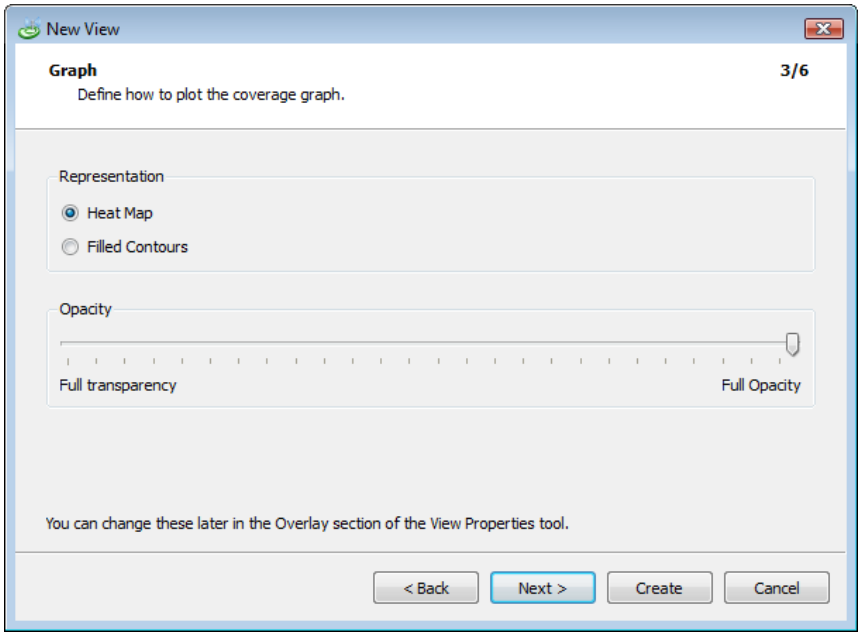
1. In this first step, you define two important view properties: its name and type. The type is the quantity that will be used to make regression calculations from the data recorded in the survey points. All the available types are provided in the drop down list. The name must be unique as it is used as an identifier.



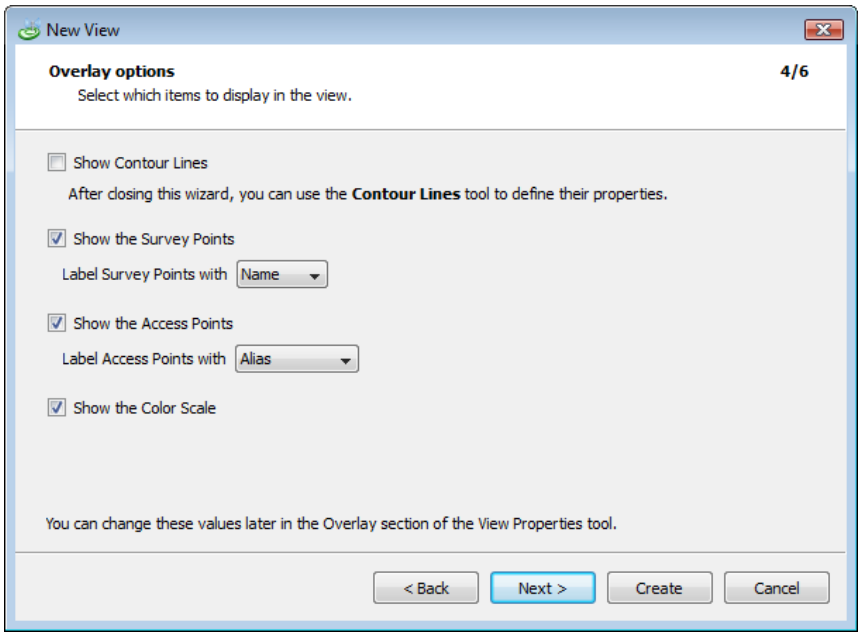
2. In this second step, you set the source access point. Your have probably recorded many different access point in your survey data. Here you can specify which one(s) should be taken into account for this new view by defining a filter. See the section called “ Source APs ” [64] for more information.


New View
Source APs
2/6
The coverage graph is calculated for the selected source access point(s).
MAC Address
00-A0-F8-AC-61-9B
Select a source access point, with its MAC Address
SSID
myWireless
Select multiple source acess points, sharing the same a SSID
Display an icon on the map for each selected source(s)
< Back
Next >
Create
Cancel

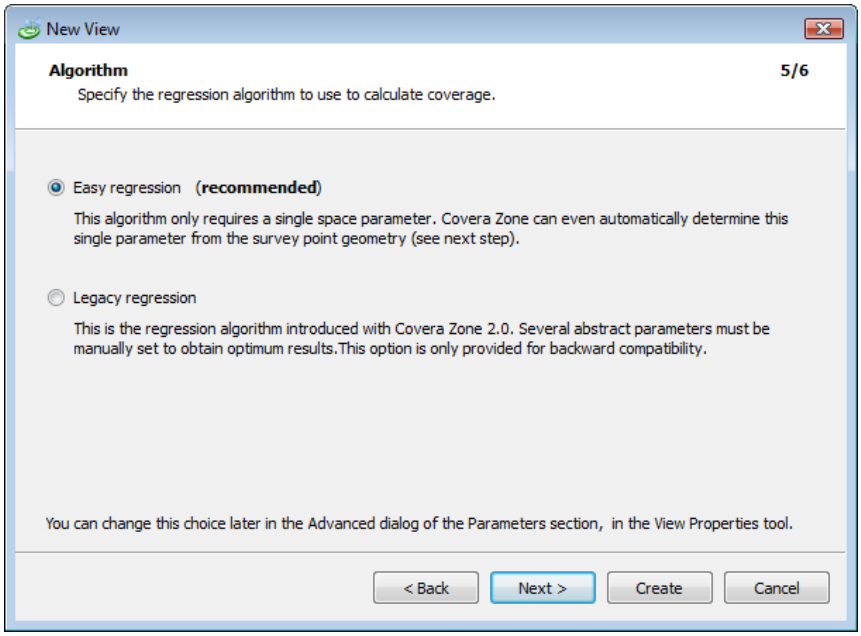
3. At this third step, you define how to represent the result of the regression calculation.



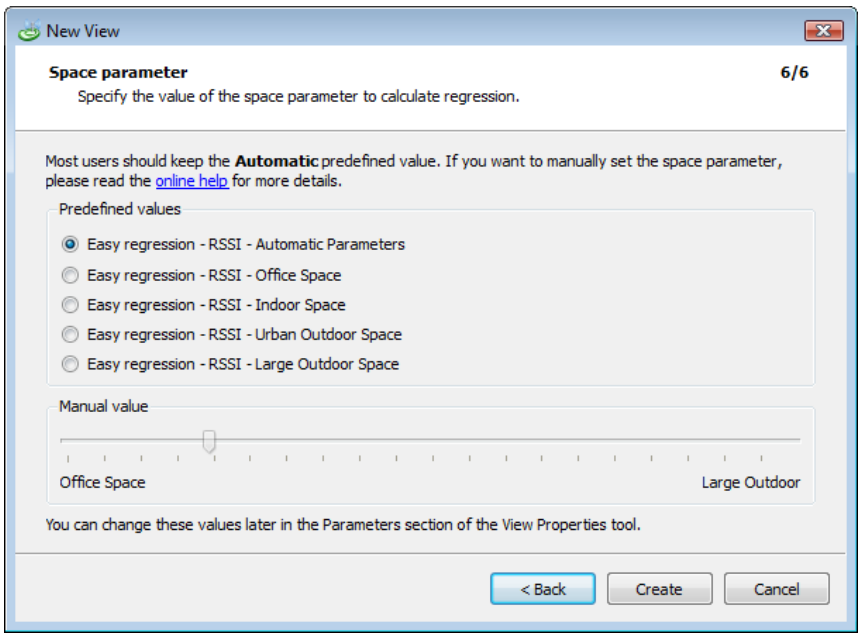
4. At this fourth step, you define which elements to show on your map, and how to show them.


New View
Overlay options
4/6
Select which items to display in the view.
Show Contour Lines
After closing this wizard, you can use the Contour Lines tool to define their properties.
Show the Survey Points
Label Survey Points with
Name
Show the Access Points
Label Access Points with
Alias
Show the Color Scale
You can change these values later in the Overlay section of the View Properties tool.
< Back
Next >
Create
Cancel

5. At this fith step, you choose which regression algorithm to use. Most users should keep the recommended value which is the **Easy Regression** algorithm. See the section called “Advanced Parameters” [67] for more information about these two different algorithm.


New View
Algorithm
5/6
Specify the regression algorithm to use to calculate coverage.
Easy regression (recommended)
This algorithm only requires a single space parameter. Covera Zone can even automatically determine this single parameter from the survey point geometry (see next step).
Legacy regression
This is the regression algorithm introduced with Covera Zone 2.0. Several abstract parameters must be manually set to obtain optimum results.This option is only provided for backward compatibility.
You can change this choice later in the Advanced dialog of the Parameters section, in the View Properties tool.
< Back
Next >
Create
Cancel

6. At this sixth step, you have the option to define the **Space Parameter** used by the regression algorithm. In most cases, there is no need to change the default value, which is to automatically determine the space parameter from the survey point geometry. See the section called “Parameters”[66] for more information.

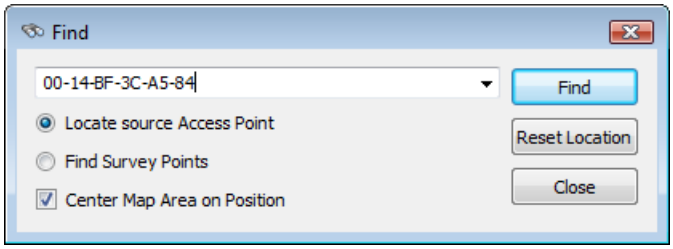

New View
Space parameter
6/6
Specify the value of the space parameter to calculate regression.
Most users should keep the Automatic predefined value. If you want to manually set the space parameter, please read the online help for more details.
Predefined values
Easy regression - RSSI - Automatic Parameters
Easy regression - RSSI - Office Space
Easy regression - RSSI - Indoor Space
Easy regression - RSSI - Urban Outdoor Space
Easy regression - RSSI - Large Outdoor Space
Manual value
Office Space
Large Outdoor
You can change these values later in the Parameters section of the View Properties tool.
< Back
Create
Cancel

If you want to set the space parameters manually, you should choose a value that represents the typical free space between obstacles in your propagation environment. The optimal space parameter value depends on the propagation environment and the survey point geometry.

Find dialog

Covera Zone can represent stations with icons on the map. The **Find** dialog will help you locate either stations or survey points on the map area.

To show this dialog, select **Edit** → **Find** from the menu.



Locate source Access Point — Check this to find an access point. The drop down menu will be populated with the list of all kown stations.

Find Survey Points — Check this to find a survey point. The drop down menu is populated with the list of all survey points, sorted by name.

Find — Look for a matching item based on the input given in the drop down menu. Survey points are matched by name and access points by Mac address. If a matching item is found, it is then selected.

Center Map Area on Result — If checked, the map area is automatically centered on the selected item (when a matching item is found).

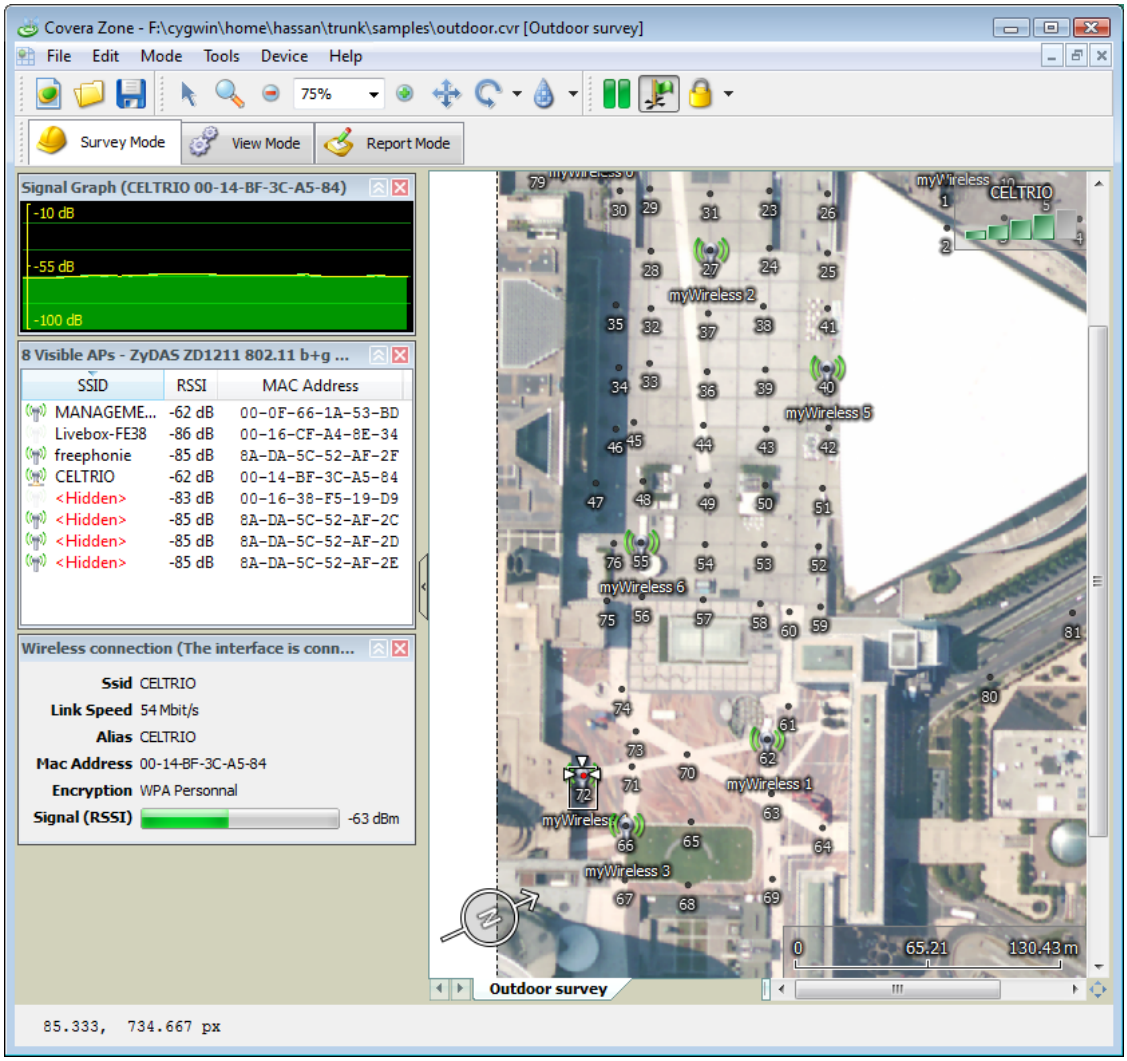
Reset Location — By default an access point is located on the survey point with the strongest signal. However, you can move the station's icon afterwards. Pressing this button will move the station back to its default position.

Close — Close the dialog.

See also the section called “How to locate stations on the map?” [98]

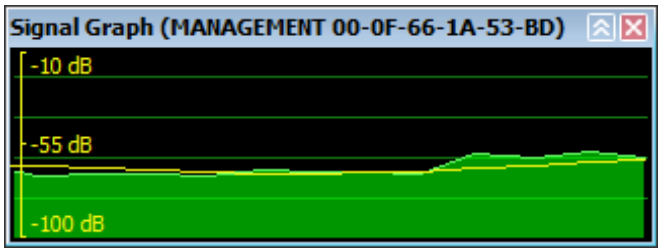
Survey mode tools

In this mode, survey points are added to a campaign either manually by giving a position on the map or automatically with a GPS receiver.



Signal graph

This tool shows the *RSSI* signal strength history of the station identified in the title bar. The green graph represents the instant RSSI, the yellow line represents the moving average of the instant value. You can modify the averaging windows in the options.

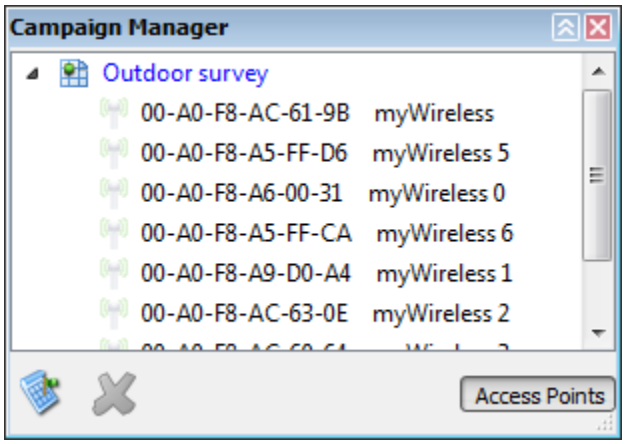


By default, the station you are currently connected to is plotted. You can change this by dragging a station from the **Visible APs** tool and droping it into the **Signal Graph** tool.

The pace of the horizontal scrolling is defined by the scanning frequency, which can also be set in the options.

Campaign manager

This tool shows all the campaigns contained in the project.

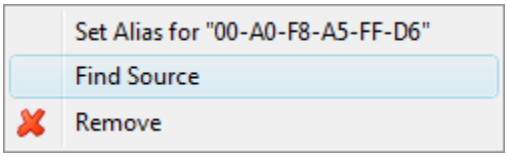


Add campaign create a campaign with the Campaign Wizard.

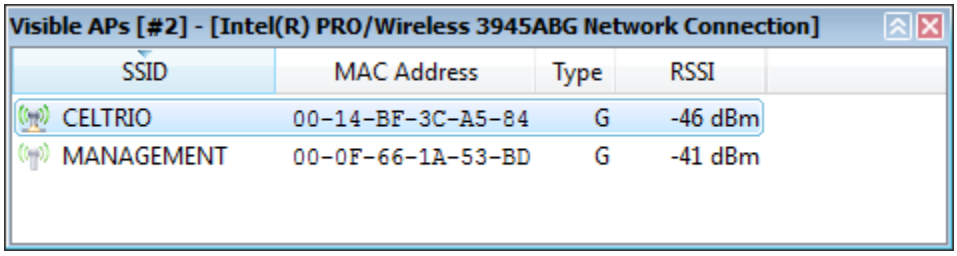
Delete remove the selected campaign and all its data from the project.

Access Points display the list of all known recorded in survey points from a campaign.

For every stations listed, a contextual menu is available with a right click. The **Locate source** action will display a station icon on the map area, next to the survey point with the strongest RSSI.



Visible APs



This tool shows the list of all visible APs in the neighboorhood. The name of the wireless device used to get this scan list is given between bracket in the title bar of the window. The list is refreshed periodically, according to a scanning interval defined in the options.

Each visible access point in the list is represented with an icon that you can drag and drop to:

- the Map area
- the **Signal Graph** tool

This icon also provides additional information about the listed access point.

connection established to this access point.

signal of this access point is being plotted the **Signal graph** tools.

access point is being chased in the **Chase AP** tool.

access point is being chased and plotted.

represents an adhoc station.

Available data

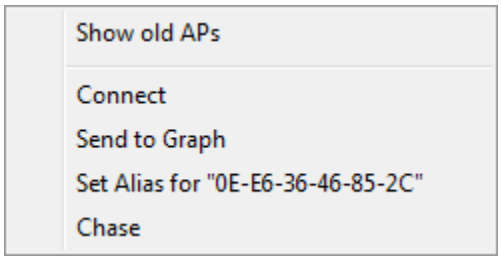
A lot of data is available for each station, but by default only a few is exposed. Right click on the column header to display the list of all available data, and choose what to display as new columns.

SSID	*Service Set Identifier* of the address (network name broadcasted by the access point).
Mac Address	*MAC address* of the station.
Alias	user defined MAC address alias
Channel	radio channel number as per the 802.11 specification. • 1 to 14 for 2.4Ghz (depending on countries) • 34 to 161 for 5Ghz (depending on countries)
Type	type of network based on 802.11 specifications (a, b, g or n).
Max rate	maximum supported rate advertized by the station.
RSSI	Instant value of the RSSI (on beacons)
RSSI average	Moving average of the instant RSSI

RSSI connected	Instant RSSI on the network link (on network traffic)
Link Quality	only avaiable under Windows Vista
Mode	topology mode of the station (`Adhoc` or `Infrastructure`)
Vendor	manufacturer of the station, based on the first bytes of the MAC address declared with the IEEE.
Security	Security mechanism based on Wi-Fi Alliance terminology (`WEP`, `WPA Personal`, `WPA2 personal`, `WPA Enterprise`, `WPA2 enterprise`)
Cipher	Encryption cipher (`None`, `CCMP`, `TKIP`)
Authentication	Authentication and Key Management (`None`, `Pre-shared key`, `802.1X`)
Supported rates	list of all the supported rates advertized by this station.
Age	Time (in seconds) since the station was last seen

Contextual menu

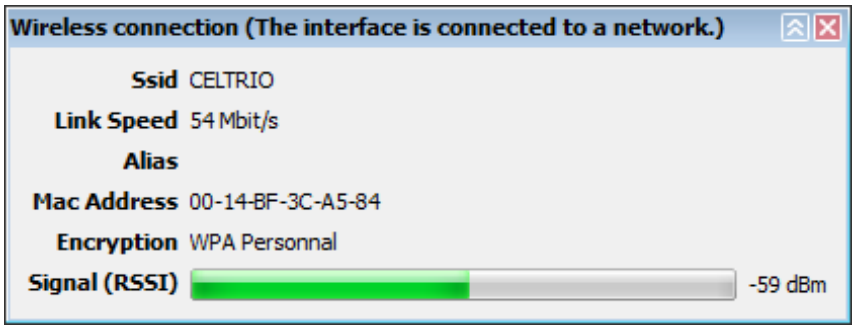
When you click on a station with the right mouse button, the contextual menu will propose several choices.



Connect	Initiate a connection the selected acess point (available only on Windows Vista)
Send to Graph	The **Signal Graph** tool is configured to plot the selected access point signal.
Set Alias	opens a dialog to specify a user defined alias for the access point MAC address
Chase	open the **Chase AP** tool
Show old APs	If checked, all the access points detected in the session are listed. Otherwise only the access points seen recently are listed.

Wireless Connection

This tool shows information about the access point you are currently connected to.



SSID	*Service Set Identifier* of the current connection.
Link Speed	Link speed of the current connection (in Mbit/s).

Mac Address — *MAC address* of the access point you are currently connected to.

Alias — Alias of the access point Mac Address (if any).

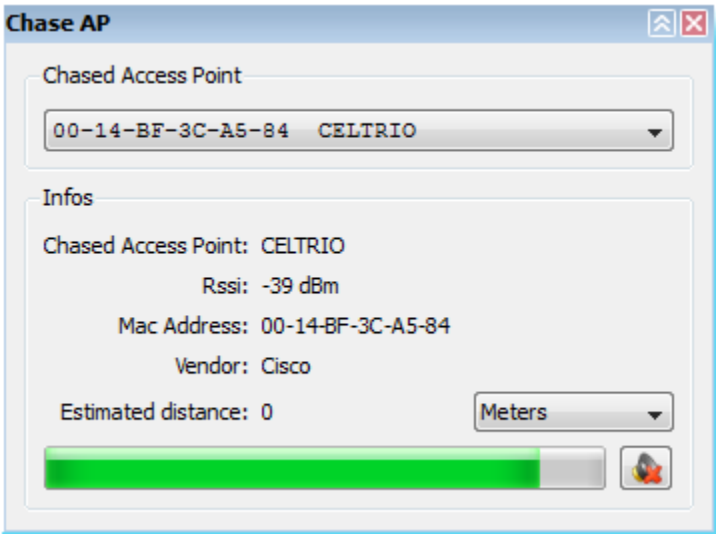
Encryption — Authentication and encryption used on the network you are currently connected to. (`WEP`, `WPA Personal`, `WPA2 personal`, `WPA enterprise`, `WPA2 enterprise`)

Signal (RSSI) — Bar graph representation of the *Received Signal Strength Indicator*.

Chase AP

The **Chase AP** dockable tool provides an estimation of the distance to a chased access point, with a sound feedback. This is useful to locate rogue access points. This tool is not visible by default, to show it:

1. Make sure you are in survey mode by clicking on **Survey** in the mode tab.
2. Select **Tools** → **Chase AP** from the menu.



Chased Access Point — This is the alias of the chase AP. Since a default alias, based on the SSID, is automatically assigned when taking a new survey point, you may see the SSID here.

Rssi — Instant value of the *Received Signal Strength Indicator* (in dBm).

Mac Address — *Mac Address* of the chased access point.

Vendor — Manufacturer of the access point, based on the first bytes of the MAC address declared at the IEEE.

Estimated distance — This is an estimation of the distance based on the RSSI, assuming a logarimthmic pathloss law. You can change the unit in the menu. The bar graph gives a visula representation of this estimation.

— Click on this icon to toggle the sound feedback. The closer the Chase AP, the higher the frequency of the sound. A different sound can be specified in the options.

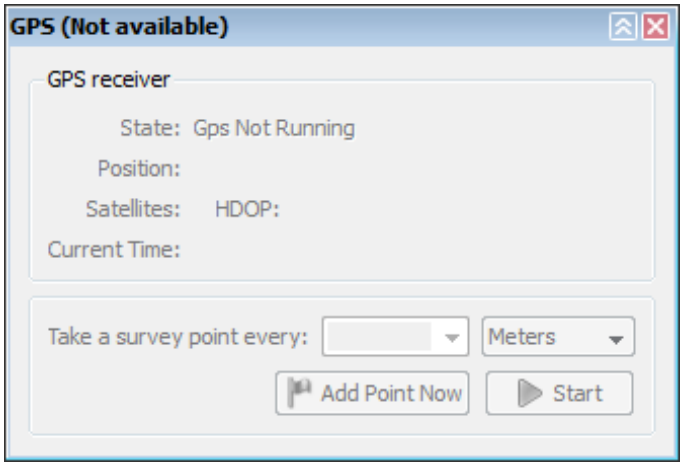
GPS

The **GPS** tool enables automatic survey point acquisition, based on the position fix provided by a GPS receiver. Please note that the GPS will only work for outdoor surveys. This tool is not visible by default, to show it:

1. Make sure you are in survey mode by clicking on **Survey** in the mode tab.

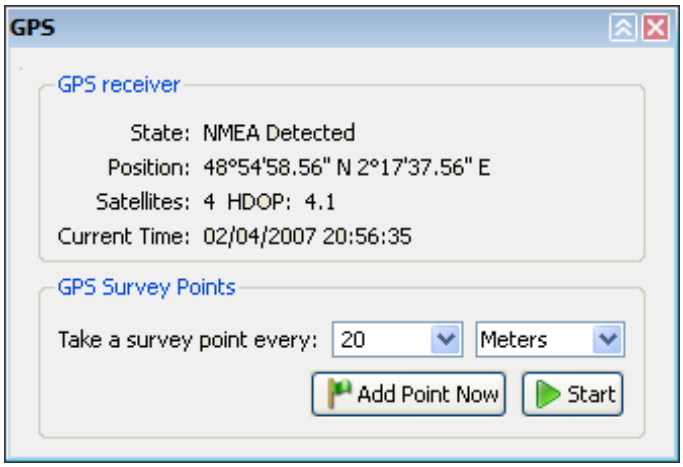
2. Select **Tools** → **GPS** from the menu.

By default, the GPS is not setup and a **GPS not running** state will be reported:



To use the GPS receiver, you must set the appropriate serial port parameters and **Enable GPS** in the options.

When correctly set, the GPS receiver will be detected when the application is launched and reported in the **NMEA Detected** state. However, the GPS receiver may need some time to provide the first position fix. When it is ready and starts sending positions, the **GPS** tool will look like this:



The following **GPS survey points** actions are available only for georeferenced campaign:

Start	Click on this button to start automatic survey point acquisition.
Take a survey point every	Minimum distance between two GPS position fixes that will trigger a survey point acquisition. The unit can be specified in the drop down menu.

Add Point now	Acquire a survey point with the current, actually last known, GPS position.

If the map is georeferenced, two circles centered on the position reported by the GPS receiver are displayed on the map.

You can get more information on geocalibration, in the the section called “How to georeference a map?” [109].

IP layer performance

Beyond layer 2 RSSI measurements, **Covera Zone** can also make IP layer performance measurements when you add a new survey point on the map. Four different measurement methods are available:

- HTTP throughput
- Latency of ICMP pings.
- TCP throughput with Iperf
- UDP throughput with Iperf

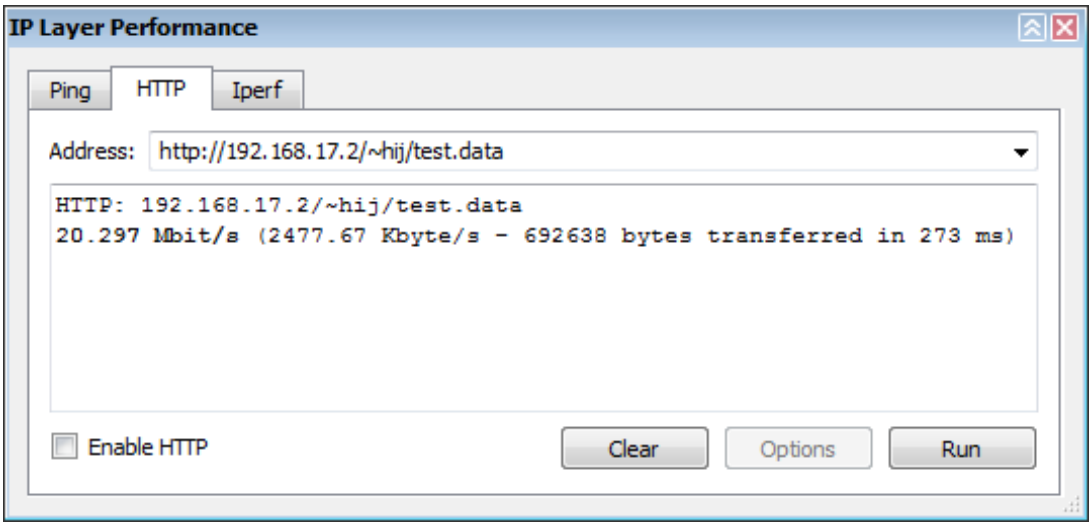
To acquire these measurements you will need a test network with a HTTP server and/or Iperf server. For more information to set-up a test network, have a look at the section called “How to measure HTTP throughput?” [103].

HTTP

Covera Zone embeds a HTTP client to measure HTTP throughput. It will request a test file from a test HTTP server. The amount of data transfered divided by the time to complete the transfer provides an estimation of the HTTP throughput.

1. Enter the complete URL of the test file on the test server in the **Address** field.
2. Press the **Run** button.

   The result of the HTTP request is printed in the console window. Please note that this throughput depends on network and RF conditions during the test.



Address	URL of the test file.
Enable HTTP	If checked, the HTTP throughput test will run for new survey points, and the result will be recorded on the new point.
Clear	Clear the console window.
Run	Run the HTTP test and output the result in the console winow. The result is not recorded in any survey point.

Test file size

A large test file will provide more repeatable measurements, but will take more time to download. Choosing the appropriate size for the test file is a matter of balancing these two factors. In any case, a test file larger that 1 Mbyte is recommended. However, **Covera Zone** will accept any file larger than 64Kbytes.

Iperf

What is IPerf?

Iperf is a commonly used client/server network testing tool that can create TCP and UDP data streams and measure the throughput of a network that is carrying them. For more informatio, see http://dast.nlanr.net/projects/Iperf/.

Using IPerf

Covera Zone 2.1 embeds an Iperf client to communicate with an Iperf server running on a test host, and acquire TCP and UDP network performance measurements in the process. Ideally the test host should be logically located just behind the wireless network. For more information, see the section called “How to make Iperf measurements?” [106].

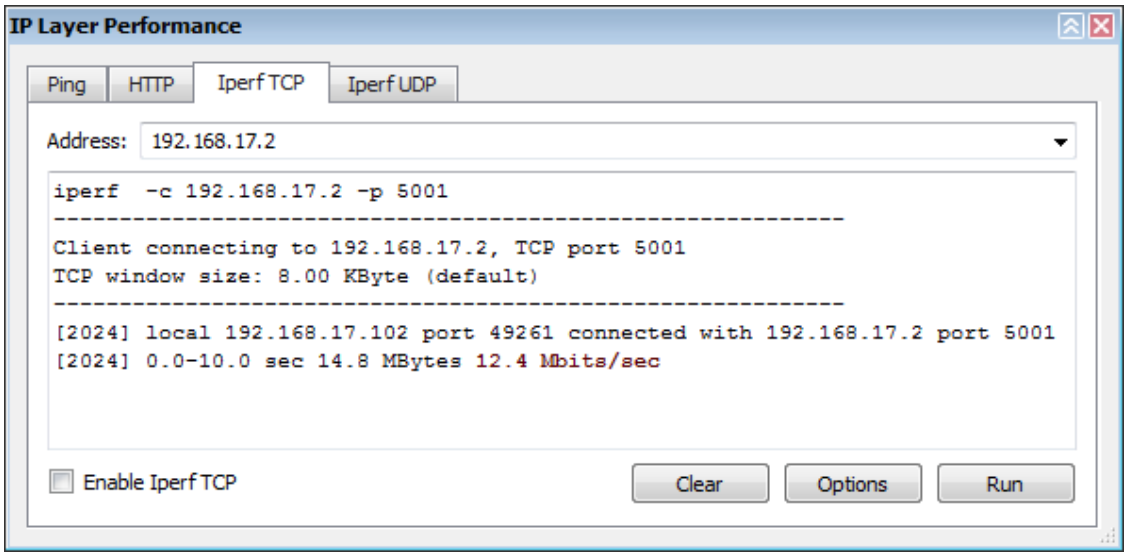
You can make both TCP or UDP Iperf measurements with **Covera Zone**. Select the appriopriate tab in the **IP Layer performance** tool.

1. Install Iperf on the test host. You can donwload Windows and Linux version from the Iperf home page.

2. Enter the address of the Iperf test host in the **Address** field.

3. Press the **Run** button.

   The result of the Iperf test is printed in the console window. By default, Covera Zone is set for a TCP test.



Address — IP address, or fully qualified host name, of the Iperf test server.

Enable Iperf — If checked, the Iperf test will run for new survey points, and the result will be recorded on the new point.

Clear — Clear the console window.

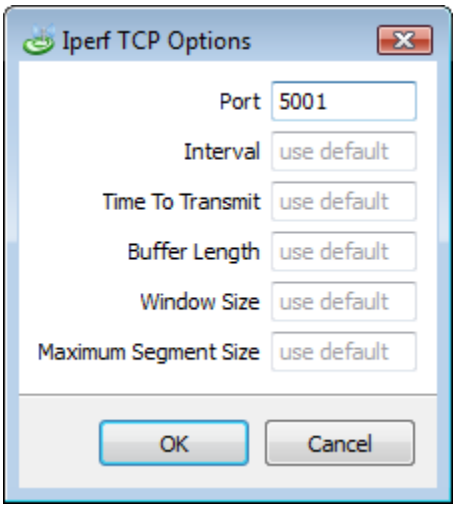
Run — Run the Iperf test and output the result in the console winow. The result is not recorded in any survey point.

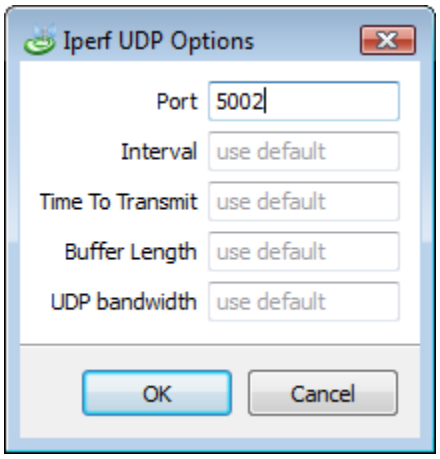
Depending on the protocol used for an Iperf test, the following data is recorded in survey points:

- For TCP tests, TCP throughput is recorded
- For UDP tests, UDP throughput and jitter are recorded.

Iperf Options

You can set several options of the Iperf client in both TCP and UDP mode. To modify these, press the **Options** button.





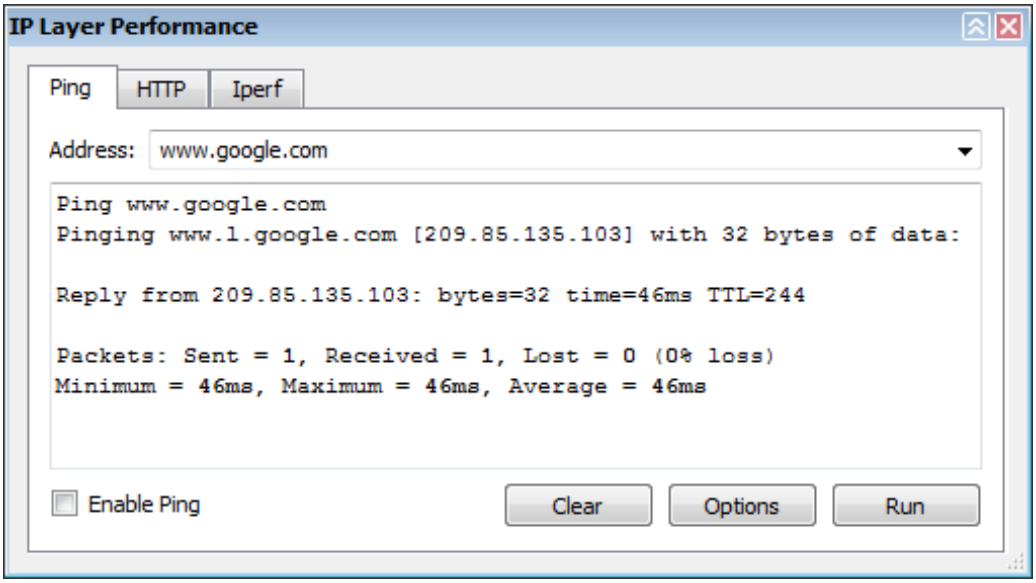
Port	Port number. Default is 5001.
Interval	Number of seconds between periodic bandwidth reports.
Time to transmit	Time in seconds to transmit for (default 10 secs).
Buffer length	Length of buffer (default 8 KByte).
Maximum segment size	Set TCP maximum segment size (MTU - 40 bytes).
Window size	TCP window size (socket buffer size).
UDP bandwidth	bandwidth to send at in bits/sec, e.g 54M for 54 Mbit/s. Recommended value: above the expected throughput.

Ping

Covera Zone can make network latency estimation by measuring ICMP ping packet round trip time from Covera Zone to a test host, ideally just behind the wireless network.

1. Enter the address of the test host in the **Address** field.
2. Press the **Run** button.

   The result of the ping request is printed in the console window.

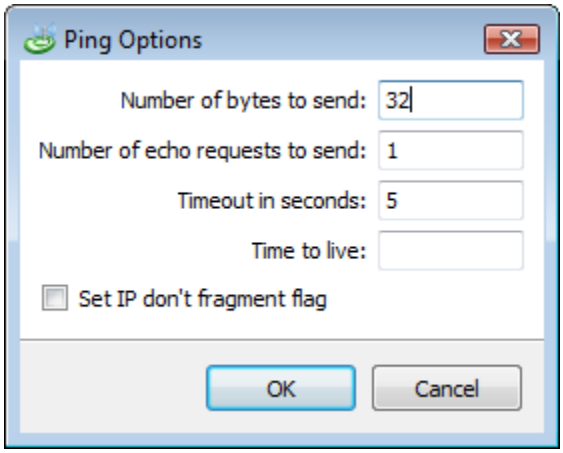


Address	IP address, or fully qualified host name, of the test host.
Enable Ping	If checked, the ping latency test will run for new survey points, and the result will be recorded on the new point.
Clear	Clear the console window.
Run	Run the ping test and output the result in the console winow. The result is not recorded in any survey point.

Note

Make sure that the firewall running on the test host will allow replies to ICMP pings.

The embedded ping client accepts the same options as the command line ping command. Press on the **Options** button to open the **Ping Options** dialog.



Number of bytes to send	Number of bytes in the payload of every ICMP echo request packet.
Number of echo request to send	Number of ICMP echo packets ("ping") to send.

Timeout	Replies taking longer than this timeout to get back from the test host are considered failed.
Time to live	Time-to-live IP field (decremented at each router hop).
Set IP don't fragment flag	Setting this flag will ask routers along the way to avoid fragmenting the ping packets.

View mode tools

Views are graphical representation of information contained in survey points. This allows you to visualize the actual coverage of a wireless network. Views are calculated by running a regression algorithm on the values recorded in the survey points. To add a view to a project, you can launch the View Wizard from different places:

- from the **View Manager**.
- from the menu **Mode** → **Add View**
- or from the contextual menu of the view tab bar.

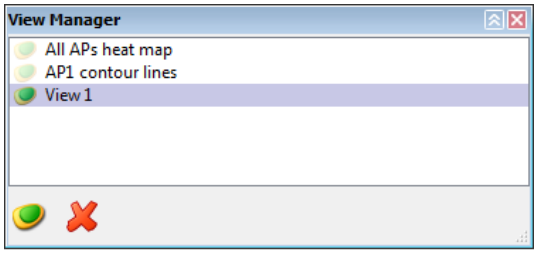
There are two different graphical representations of the regression result, each one with its own dedicated configuration tool:

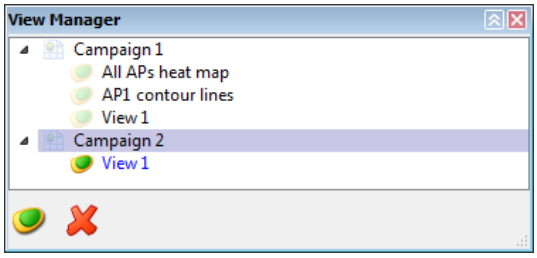
- **Heat Map Color Scale** for heat maps.
- **Contour Lines** for filled contours.

By default, all the survey points are taken into account during the regression. However, you have the option to ignore certain points that you consider as outliars. Just mark them as ignored in the survey point contextual menu.

View Manager

The **View Manager** tool shows all the views declared in the current project. If you want to change the name of a view, you can edit it in place by double clicking on the name. Each view must have a unique name. When the project contains several campaigns, the **View Manager** shows the hierarchy of all the campaigns and views.





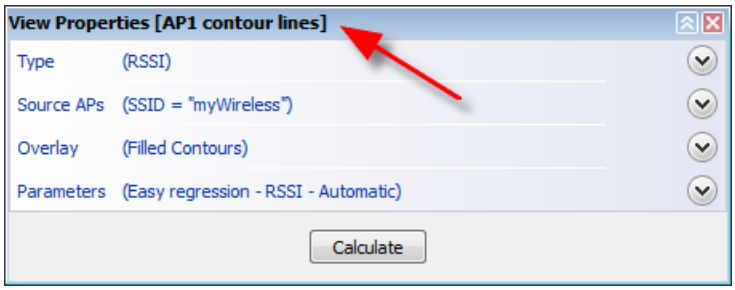
When you select a View in the **View Manager**, the display of the map area changes accordingly. You can also use the view tab bar for the purpose.

	Delete	Remove the selected view(s) from the project (after confirmation).
	Add View	Launch the new view wizard.

All the properties of an existing view can be modified from the **View Properties** tool.

View Properties

The **View Properties** dockable tool exposes all the properties of an existing view. The title bar contains the name of the view between brackets.

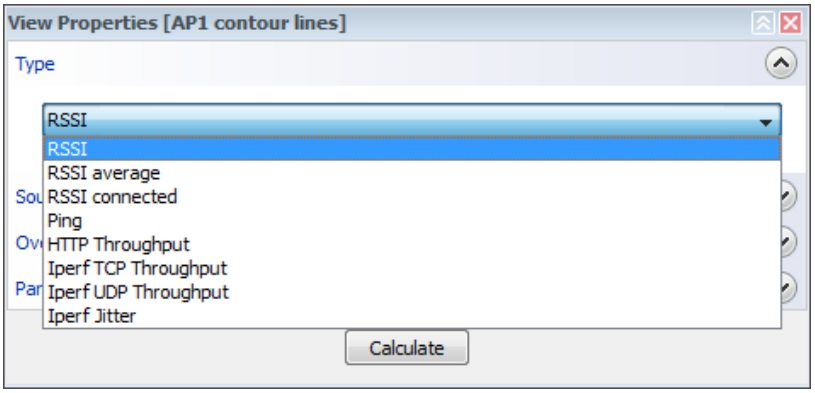


This tool is divided in several collapsible sections that you can open or close with the chevron icon on the right. Each section title is followed by a summary between brackets.

To launch the calculations required to generate a view, for instance after a property has been changed, just press the **Calculate** button.

Type

In the **Type** section, you select the quantity that will be used for the regression.



RSSI Instant value of the *RSSI*. It is recorded for every visible access point. The *NIC* typically returns the average of the RSSI observed on 802.11 beacons packet.

RSSI average This a moving average of the instant *RSSI*. It is recorded for every visible access point. See the section called “Signal Graph”[88] to modify the size of the averaging window.

RSSI connected This is the *RSSI* of the access point you were associated with at the time of the measurement. Please note this value may be different from the instant RSSI, as the NIC driver not only uses observations of 802.11 beacons but also data packets exchanged over the wireless network to compute this value.

The following types are associated the access point you were connected at the time the measurement, because they are based on real network traffic being exchanged over the wireless link. Since their acquisition take some time, they are disabled by default when you add a new survey point. See the section called “IP layer performance” [57] for more information on how to record these quantities.

Ping Latency observed during the ICMP ping test (expressed in millisecondes). See the section called “Ping” [60] for more information.

HTTP Throughput	HTTP throughput observed during the HTTP test (expressed in Mbit/s).
Iperf TCP Throughput	Throughput observed during an Iperf TCP test (expressed in Mbit/s).
Iperf UDP Throughput	Throughput observed during an Iperf UDP test (expressed in Mbit/s).
Iperf Jitter	Jitter observed during an UDP Iperf test(expressed in milliseconds).

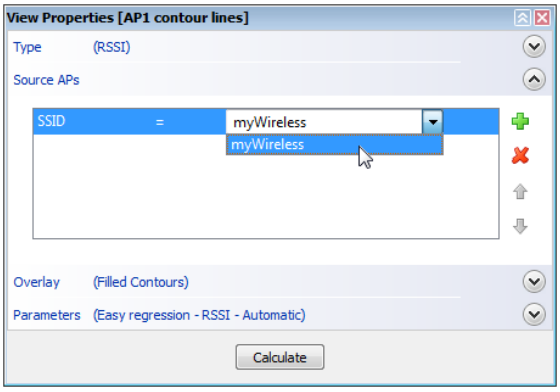
See the section called “IP layer performance”[57] and the section called “Iperf”[58] for more information.

Empty view?

Plotting a view of such a type will result in an empty graph, if the corresponding data was not recorded in the survey points.

Source APs

In the **Source APs** section, you define which source acess points are taken into account to plot the view. Only the source access point matching all the conditions of a filter are selected. A filter is made of one ore more conditions, linked together by a logical operator.

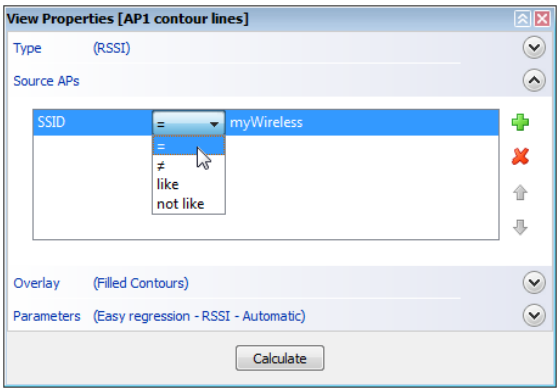


The following actions can be applied to a condition:

Add a new condition to the filter.

Remove the selected condition from the filter.

Move the selected condition up or down.



In the example above, we have defined a filter to select all the sources sharing the SSID 'myWireless'.

When adding a new condition to the filter, you must define the following elements:

What to match	Select a quantity from the drop down list menu (MAC addresses, SSID, ...).
Comparison operator	= | # | `like` | `not like`
Value to match	String for = or # operator. Wildcard expression for like or not like. In the case of a MAC address or SSID condition, a drop down list of the data extracted from the survey points data is presented.
Link Operator	`and` | `or`. Only required if you want to link several conditions together.

Note

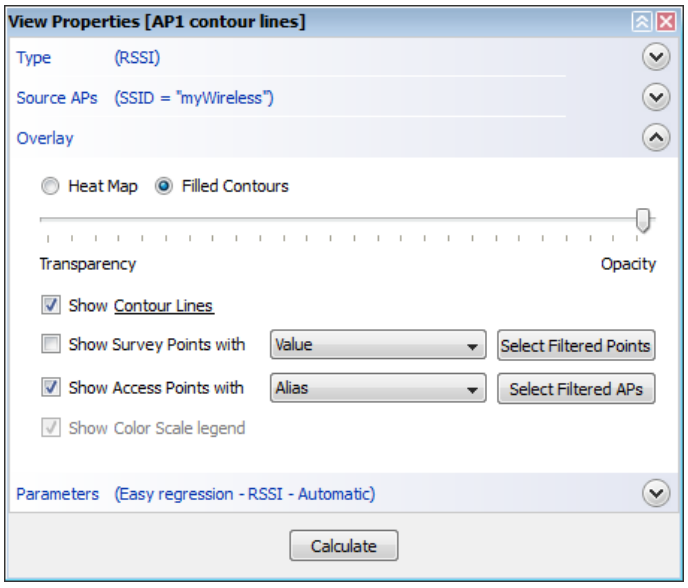
A wildcard expression is a string of characters that may be substituted for any of a defined subset of all possible characters. Any character represents itself apart from the two mentioned below.

- *?* matches any single character.
- * matches zero or more of any characters.

When a filter selects mulitple sources (for instance with a condition like SSID = 'MyWireless'), and when the type of the view is set to RSSI, then a regression per source will run. The final result for every pixel is the strongest regressed signal of all the sources. Since there is a regression calculation per source, the total calculation time is more important for views with multiple sources. The rationale is to simulate a wireless NIC that will always associates to the strongest access point.

Overlay

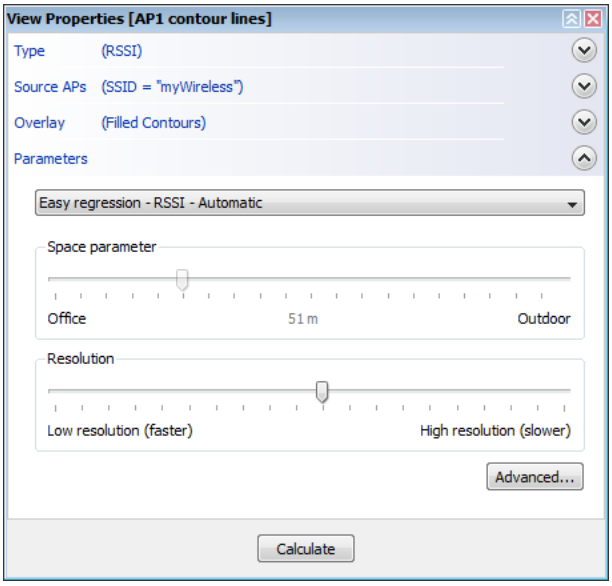
In the **Overlay** section, you can control what is displayed in the map overlay layer while in view mode, and how it is displayed. When the section is closed the type of plot (heat map or filled contour) is given between brackets.



Heat Map	Values calculated by the regression algorithm are plotted as a heat map, defined in the Heat Map Color Scale dockable tool.
Filled Contours	Plot filled contours. The filled regions are delimited by contour lines, defined in the Contour Lines dockable tool.
Transparency , Opacity	This slider controls the level of transparency of the regression plot.
Show Contour Lines	If checked, contour lines will be added to the overlay. The values and other properties of contour lines can be modified in the **Contour Lines** dockable widget. You can open this tool from the **Tools** menu or by clicking on the underline hyperlink.
Show Survey Points	If checked, survey points are added to the overlay. You can also choose the label to show below survey points.
Show Access Points	If checked, access points with a position are represented with an icon over the map area. You can also choose the label to show below the icon in the drop down menu. To assign a position to, or locate, an access point, drag drop live APs from the **Visible APs** tool or recorded APs from the **Survey Point Data** to the map area. You can also use the dialog to locate APs on the map.
Select Filtered Points	Select all the survey points that satisfy the filter so that you visualize them over the map area.
Select Filtered APs	Select the icons of all the access point that satisfy the filter so that you visualize them over the map area.

Parameters

In the **Parameters** section, you can define the parameters of the regression algorithm used for the view. When the section is closed, the name of the selected profile is given between brackets.



Profile

Predefined profiles are proposed in the drop down menu for usual propagation environment situations. You can also specify a user-defined profile to adapt to your specific situation.

Space parameter This slider sets the space parameter. In an office environment, the space size paramter typically around 5m, whereas in indoor environment it may be around 15m, and around 50m for a suburban outdoor environment.

What is the space parameter?

To make a prediction for a given position, the regression algorithm uses the values recorded at survey points around this position. The Space parameter is the radius of influence around a survey point. Predictions within this radius use the value of the survey point. Predictions outside the influence neighborhood gradually ignore the value.

The value of Space parameter is as a length. The optimal value depends on the propagation environment and should represent the typical freespace between obstacles in your environment. The more irregular the environement, the smaller the Space parameter. A very irregular environment like an office space requires a smaller Space Parameter, whereas a regular environment like outdoor space requires a larger one. Several predefined values are proposed for typical environments.

Resolution The higher the resolution, the more pixels to calculate and the longer the calculations.

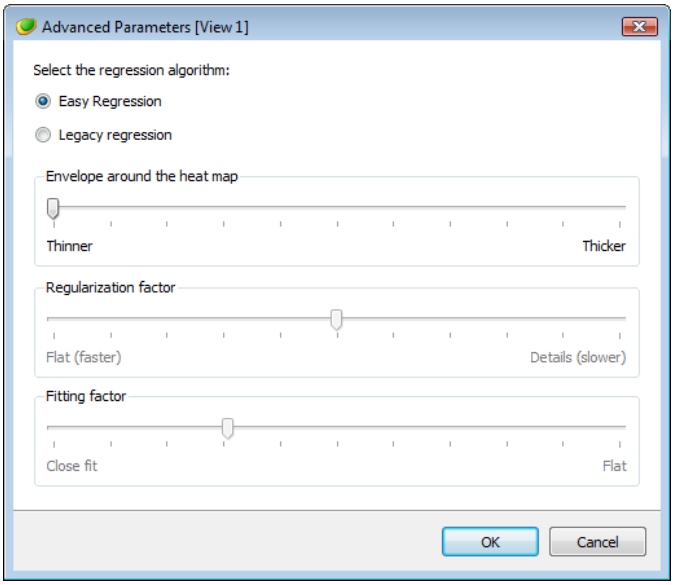
Low resolution: the regression is calculated only for one pixel out of twenty.

High resolution: the regression surface is calculated for every pixel.

Advanced open the **Advanced Parameters** dialog where you can change the regression algorithm.

Advanced Parameters

In this dialog you can choose which regression algorithm to use to calculate the view.



Easy regression This a new regression algorithm introduced with **Covera Zone 2.1** based on machine learning theory. It is easy to use since the **Space pa-**

rameter is the only required parameter, and is faster and more robust on most data set.

Legacy regression This is the regression algorithm introduced with **Covera Zone 2.0**. It is not recommended to use it for new projects and is only provided for backward compatibility. The following two parameters must be defined:

Regularization factor: This factor is used by the regression algorithm to penalize outliars. The higher the factor, the more difficult it will be for a survey point to be considered an outliar. A lower factor will flatten the result, when a higher factor will give an output with more details, due to the important weight attribute to outliars.

Fitting factor: This factor is used by the regression algorithm to determine how close the survey point value it should fit. If you set it to high, then the algorithm will not try to fit close the measured values and the result will be a flat surface.

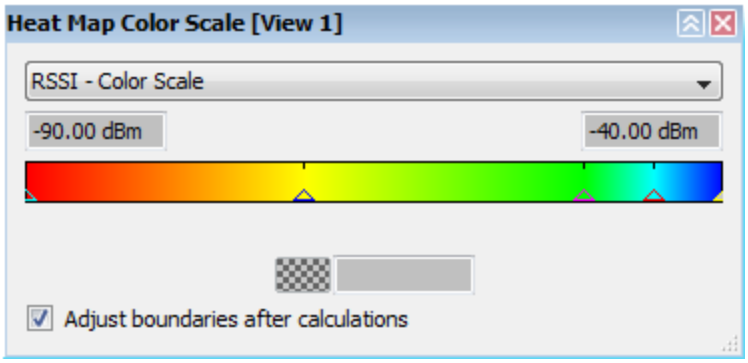
Envelope around the heat map This parameter can be used with both regression algorithms. It defines the size of the envelope (in pixels) around the border of the heat map.

Heat Map Color Scale

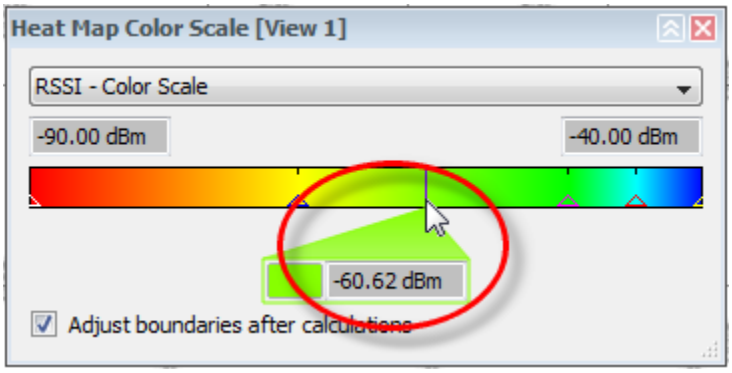
The **Heat Map Color Scale** tool is used to define a color scale for the heat map representation. Each heat map view has its own color scale. This tool is not visible by default, to show it:

1. Make sure you are in view mode by clicking on **View** in the mode tab.

2. Select **Tools** → **Heat Map Color Scale** from the menu.



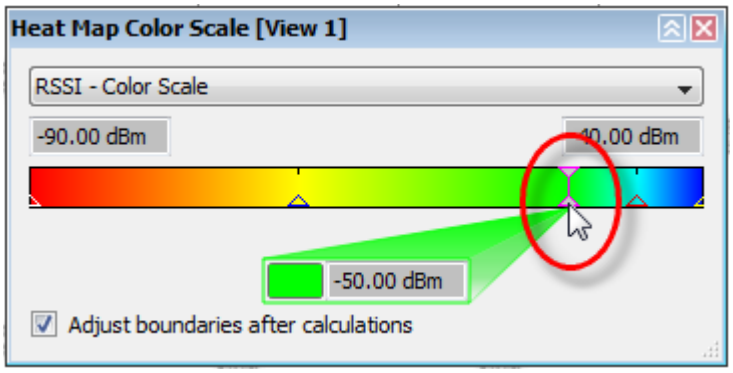
When you move the cursor over the color band, the corresponding value is shown in the box below the color band. If the **Adjust boundaries after calculations** box is checked, the values of the boundaries of the color scale are automatically modified to fit the boundaries of the regression surface. This will ensure that the color scale is always adapted to the variations observed in the regression surface, but will modify the meaning of each color after a new calculation.



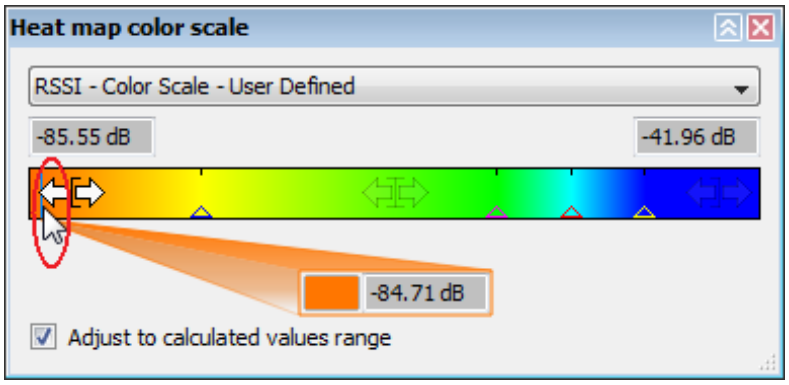
Over the color scale band, you will notice small triangles. Each triangle is a symbol for a control point. Control points are fixed a couple of value and color. The other colors are linearly interpolated to and from the bounding control points. Control points can be moved, edited, deleted and added as explained below.

To change the value associated with a control point:

1. Select the control point you want to change by clicking on the triangle. A double triangle will appear to show that the control point is actually selected.



2. Now while clicking on the control point, move it to a new position.

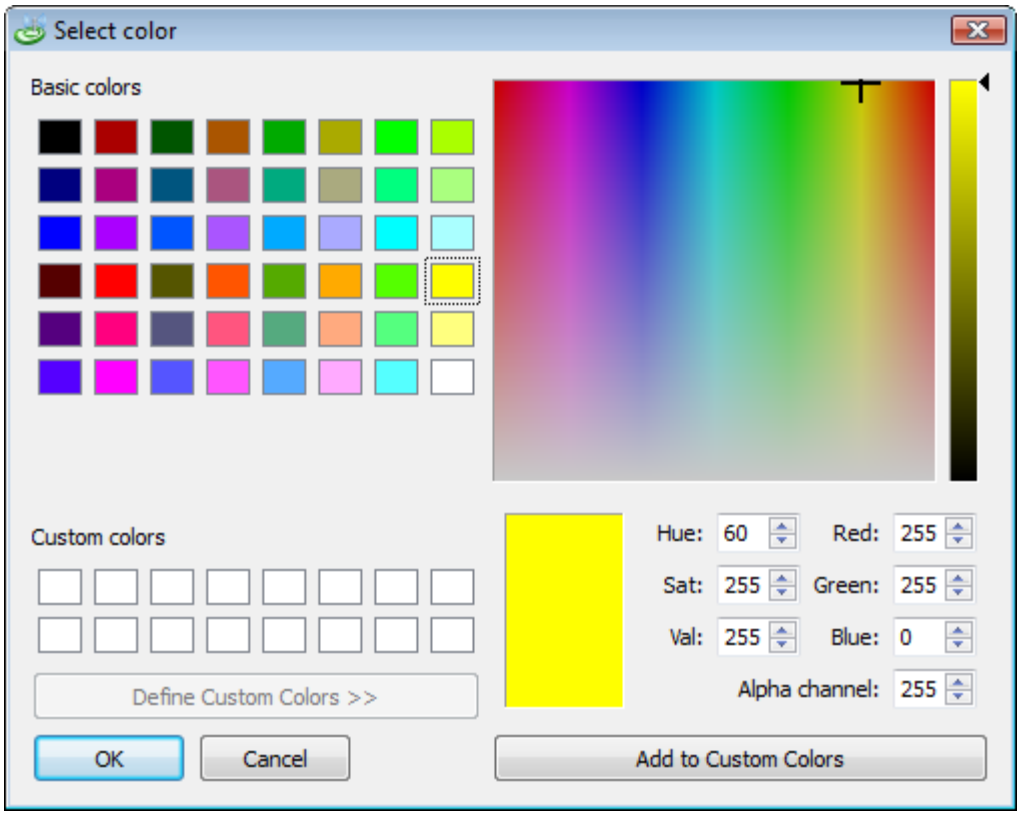


The same color is now associated to a different value.

- You can also directly type a value in the input box and press **Enter** to validate.

To change the color associated with a control point:

1. Double click on a control point triangle. The color selection dialog will show up.



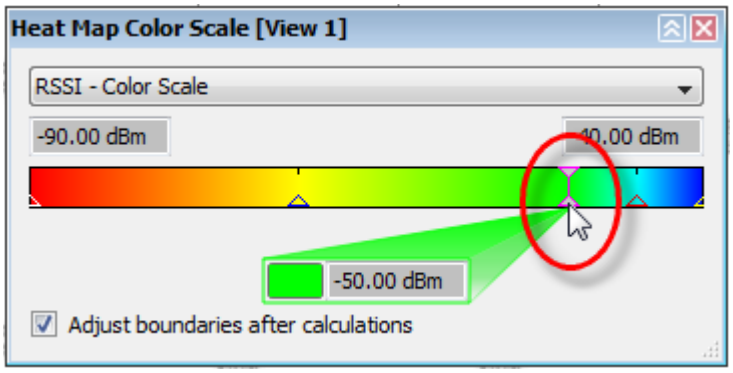
2. In the **Select Color** dialog, pick up a different color.

3. Click on the **OK** button

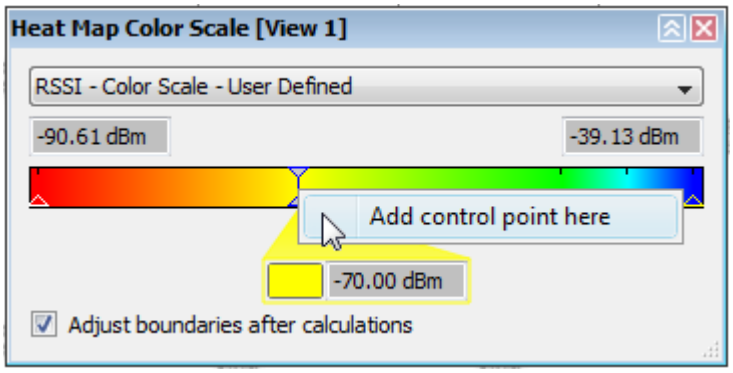
   The control point value is now associated with your new color.

To delete a control point:

1. Select the control point.



2. Press the **Delete** key on the keyboard. Be careful, the control point will be deleted without asking confirmation.



The scale is automatically updated to reflect your change.

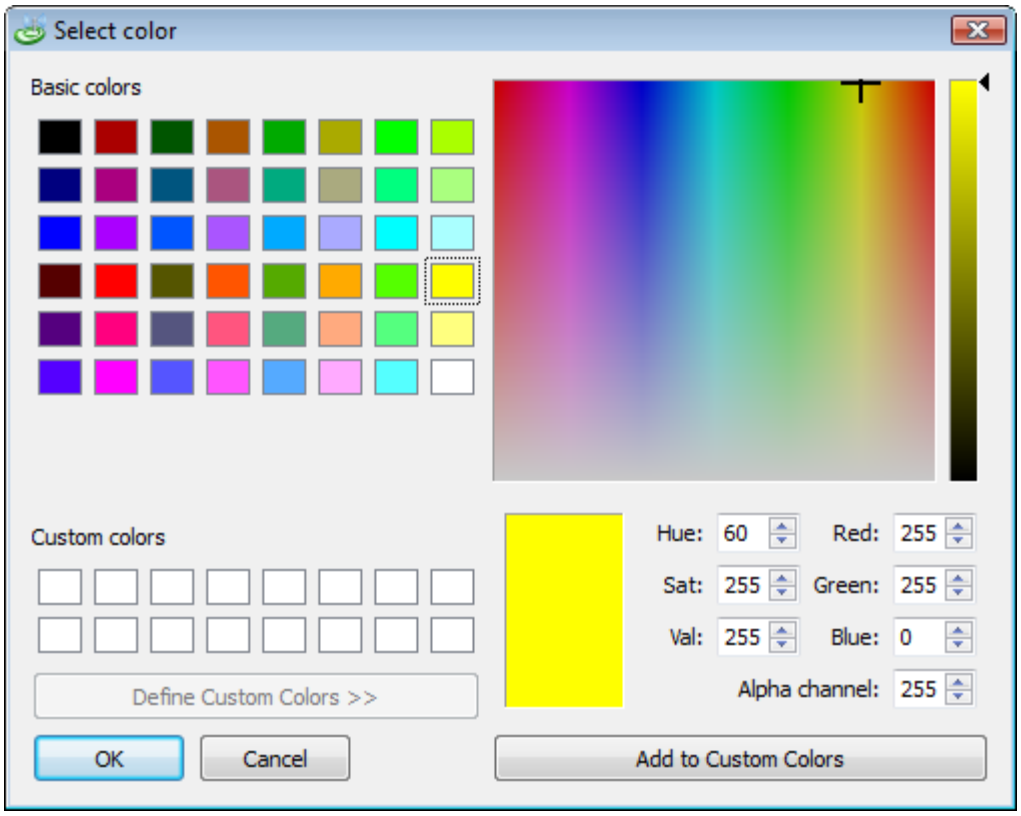
- You can also delete a control point by selecting **Delete this control point** from the contextual menu that appears with a right mouse click over the control point.

To add a new control point for a given value:

1. Make sure no control point is selected (click anywhere but on a triangle to unselect a control point)

2. When you move around the band, notice the variations of the values in the box below the band.

3. Double click in the band, where you want to add a new control point. The color selection dialog will show up.

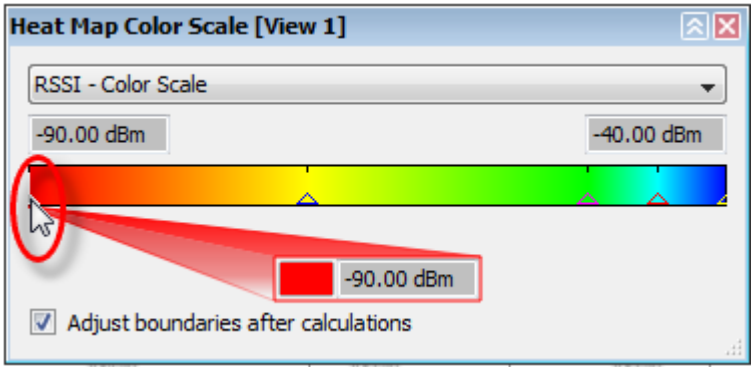


   - You can also add a control point by selecting **Add control point here** from the contextual menu that appears with a right mouse click over the desired position.

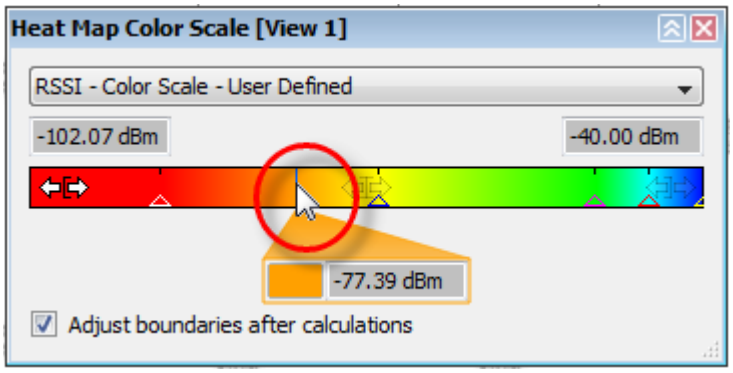
4. Select a color and press **OK**

You can modify the boundaries of the color scale. For instance, to decrease the minimum:

1. Grab the color scale by pressing on a left end of the band and keep pressing.



2. While pressing, move the cursor to the right. Notice how the minimum value is modified and how the overall scale is shifted as you move. When the minimum value has reached the value you expect, release the mouse.



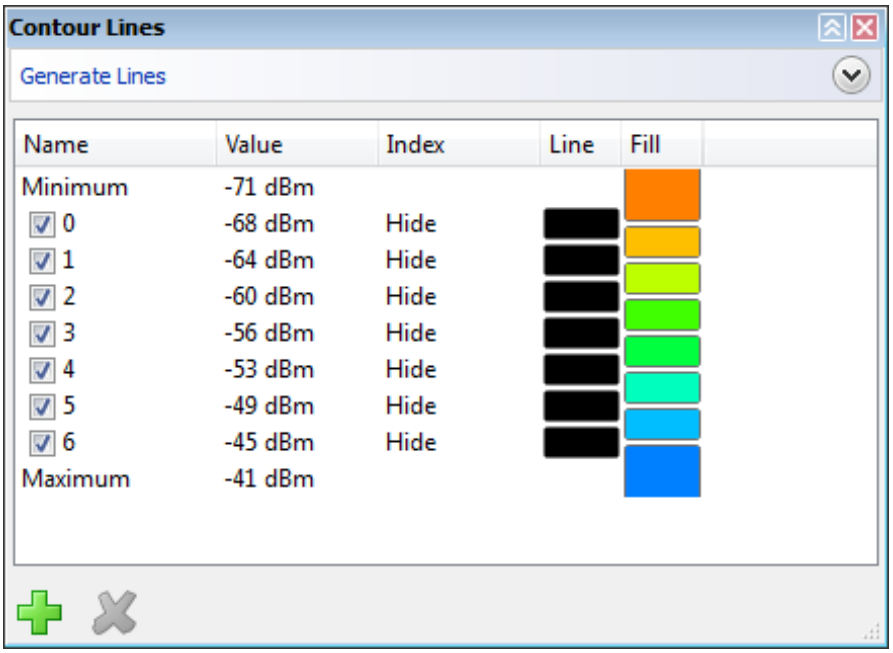
   - You can also type directly the minimum and maximum values in the appropriate fields at both ends of the scale, and validate with **Enter**

Contour Lines

The **Contour Lines** tool is used to set contour lines and their related properties. A contour line is defined by a value called the index of the line (in dBm or MBit/s depending on the view type). The contour line will separate the area where the interpolated value is higher than the index from the area where the interpolated value is lower than the index. This tool is not visible by default, to show it:

1. Make sure you are in view mode by clicking on **View** in the mode tab.

2. Select **Tools** → **Heat Map Color Scale**



Name — This is the number assigned to the contour line. If you uncheck the checkbox then the line will not be drawn.

Value — Value of the index for the line. Can be edited in place by clicking on it.

Index — Show or hide the value of the index defining a contour line.

Line — Color of the contour line. You can change this color by clicking on the color rectangle.

Fill — Color of the region between two contour lines (filled region plot). You can change this color by double clicking on the color rectangle.

Minimum — Pseudo line entry for the minium of the regression (available only after a calculation). Never represented in the mapa area.

Maximum — Pseudo line entry for the maximum of the regression (available only after a calculation). Never represented in the mapa area.

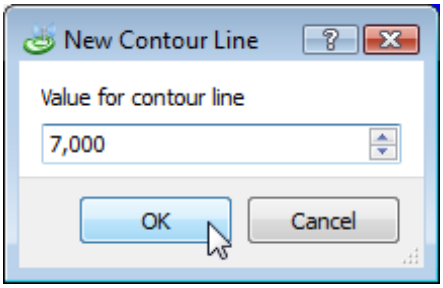
Note

Countour lines can be drawn on top of a heat map representation, or used to create a filled contour representation. In this case, the filled countour has its own color scale defined in the **Fill** column, which is independatn from the heat map color scale.

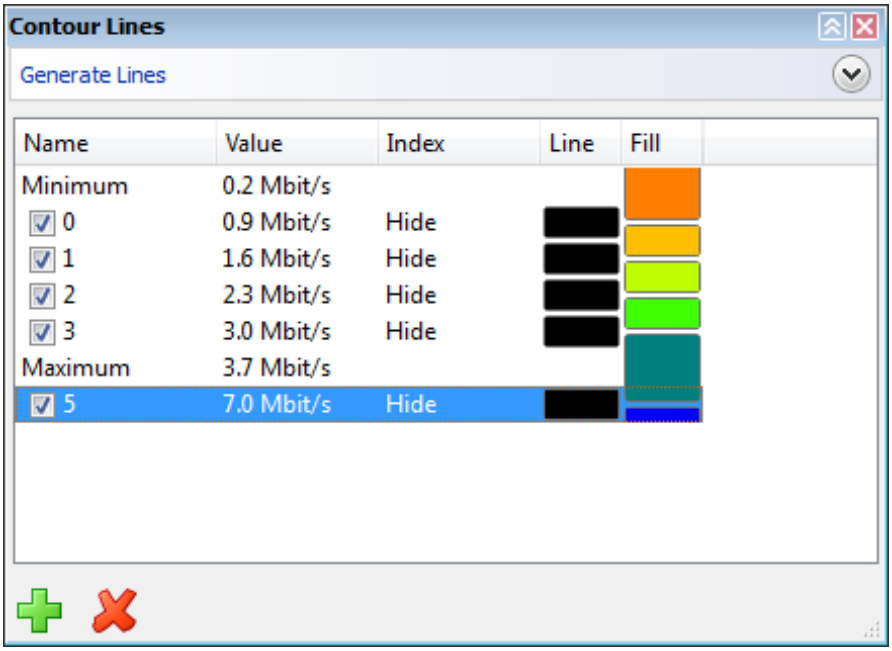
Adding a contour line

1. Click on **Add** . The **New Contour Line** dialog will show up.

2. In the **New Contour Line** dialog, enter the value for you new line.



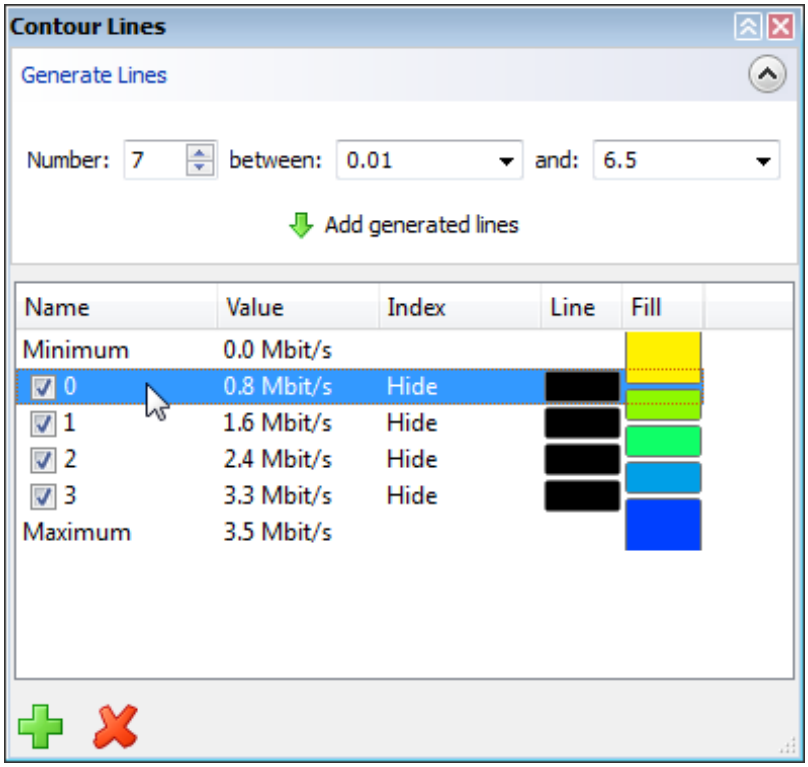
3. Click on the **OK** button to actually create the new line. It is now listed with the others.



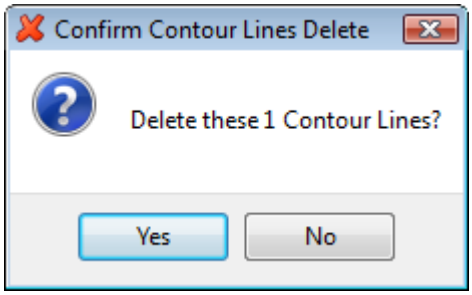
You can a line outside of the minimum, maximum interval. It will be listed here but will not be visible in the map overlay.

Deleting contour lines

1. Select the contour line you want to delete. You can select multiple lines by simultaneously pressing the **Shift** or **Crtl** keys during the selection.



2. Click on **Delete** . The confirm dialog will show up.



   - You can also press on the **Delete** key on the keyboard.

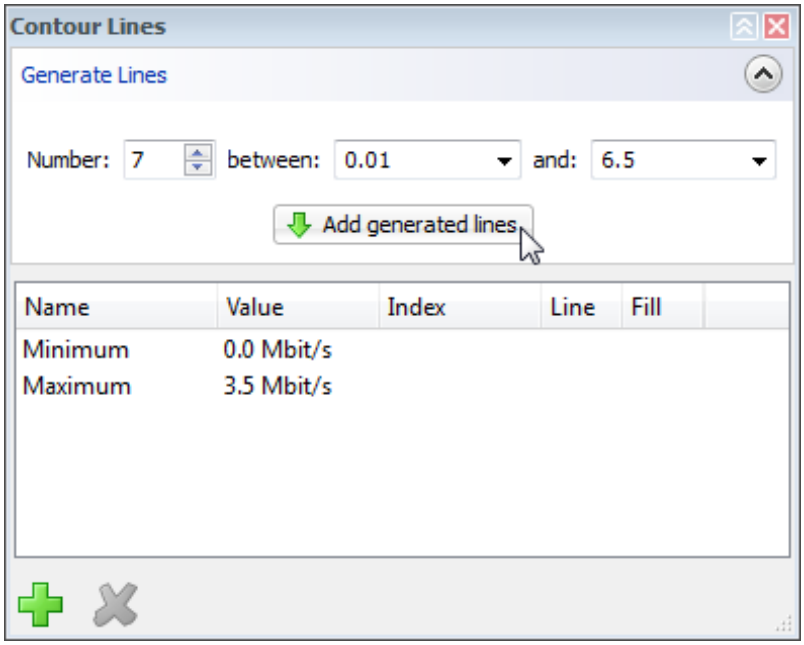
3. In the **Confirm Contour Line Delete** dialog, click on the **OK** button to confirm.

Generate Lines

The **Generate lines** feature is handy to automatically generate several contour lines in a single operation. Generated lines will be evenly spaced, in terms of index value.

1. From the menu, select **Tools** → **Contour Lines** to display the corresponding dockable tool (if not already on the screen).

2. Click on the chevron icon to open the **Generate Lines** section the **Contour Lines**.



Temporary dotted lines appears on the map overlay. These lines have been spaced according to the default settings.

3. You can now modify these settings and decide how many lines you want to add, along a specified interval. The interval depends on the type of quantity (RSSI, throughput, ...) set for the view.

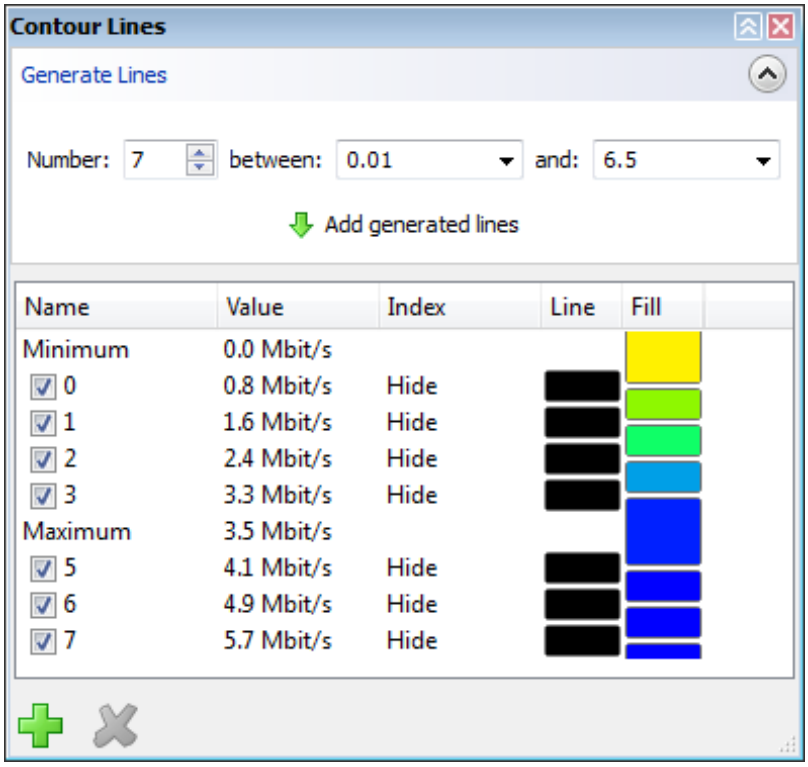
   Number Number of lines to generate. Determines the spacing between lines.

   between generated lines will have a value greater than this *Minimum*

   and generated lines will have a value lower than this *Maximum*

4. Press **Add generated lines** to confirm your choice.

   If you close the section before confirmation, the temporary lines will disappear. If you confirm, your new lines will be listed, and also appear on the map overlay with a plain line style.



5. The **Fill** colors have been automatically determined from the **Heat Map Color Scale**.

Report mode tools

The report mode is used to create reports based on campaign data (for archival purposes) and regression views calculated on this data (for graphical presentation purposes). Four different output formats are supported:

Simple HTML	static HTML output (views and compositions are exported as PNG images).
Interactive HTML	dynamic HTML (views and compositions are exported as PNG images).
KML	for use in Google Earth (only for geocalibrated campaigns).
Rich Text Format, RTF	for use in text processing software such as Microsoft Word.

If you just want to export raw data in XML or CSV format without the graphical views, select **File** → **Export Data** from the menu bar.

Report Manager

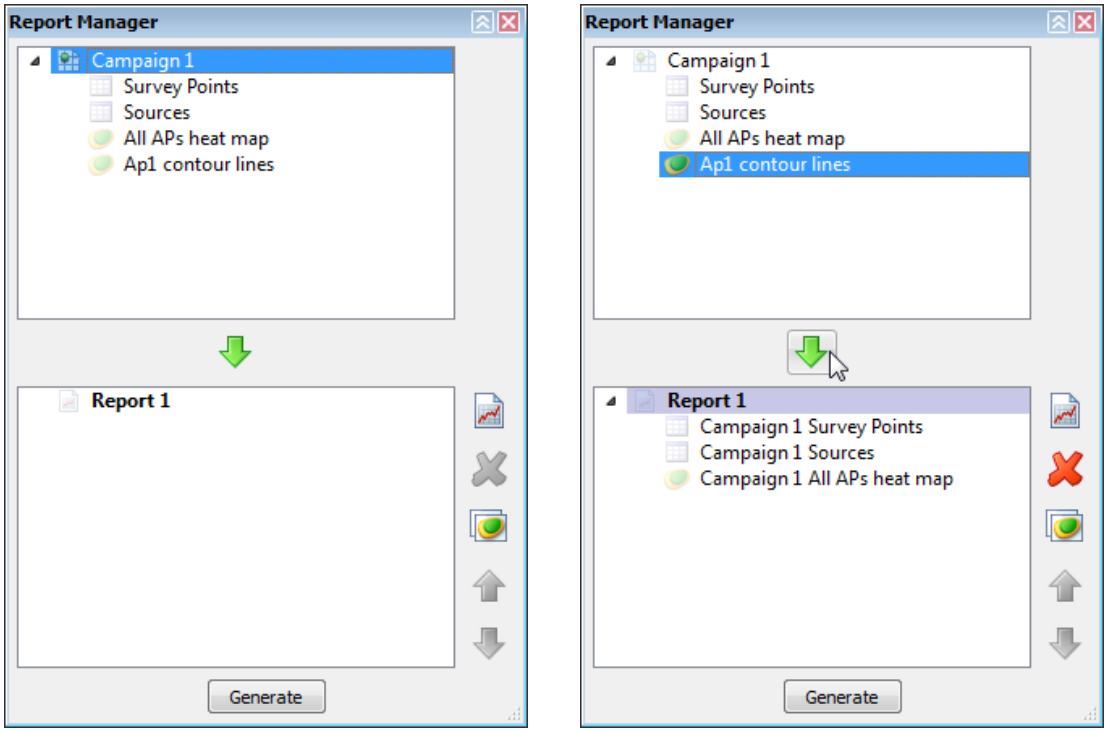
The **Report Manager** tool is used to select the elements to include in a report. The available report elements are:

- views defined in the project
- composition of views
- the list of survey points and their measurements recorded in a campagin

- the list of access points recorded in a campaign

This **Report Manager** tool is divided in two parts:

- the top part shows all the campaigns and views of the project.
- the bottom part shows the list of reports and their contents (exported elements).



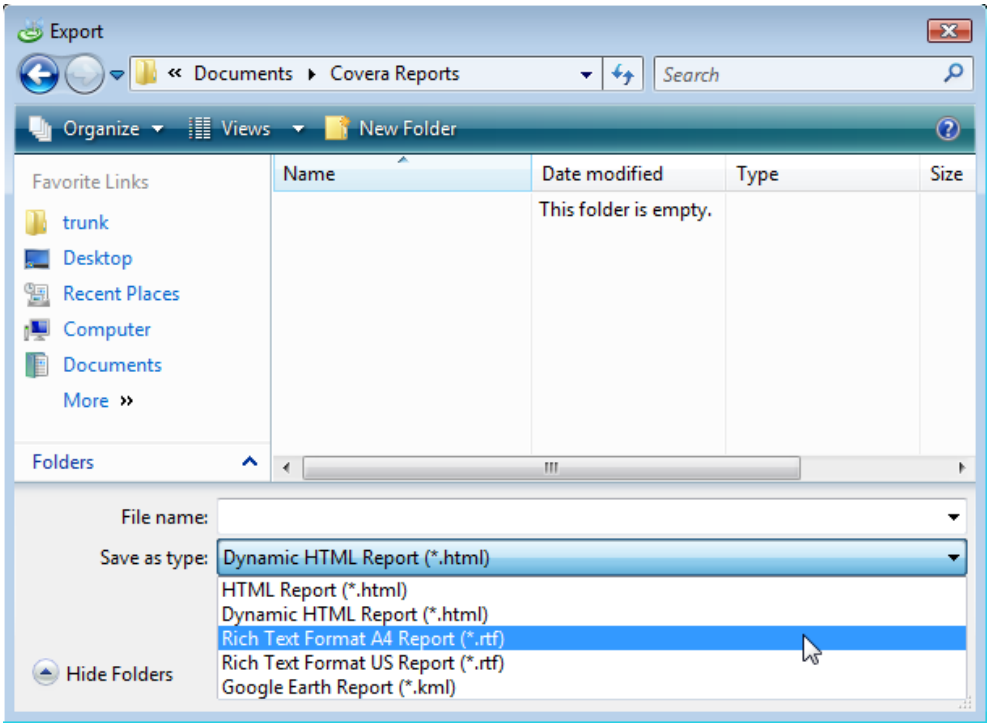
	Export	add an element selected in the top part to the active report (in bold in the bottom part).
	Add report	An empty report is automatically created for a new project. You can add additional report with this button.
	Add composition	Add a new composition to the active report.
	Delete	Delete the selected report(s) and element(s) in the bootom part of the **Report Manager**.
	Move up & **Move Down**	The order of the elements in a report is the same as the order of the elements in the tree shown in the bottom part. You can use these two arrows to modify this order.

To generate the active report,

1. If several reports are defined, select the report you want to generate. The active report is the one displayed in bold in the bottom part of the window.

2. Click on the **Generate** button.

3. Choose a file name and the report format in the following dialog.



4. Press the **Save as** button.

Note

Generating a report may take some time, depending on the amount of data in the report and the format (RTF reports require more processing). During this time the user interface may be unresponsive.

Composition

Create a composition

A composition is a superimposition of two or more views, from the same campaign or from different campaigns of the same project. Composition are useful to vizualize overlaping areas.

To add a composition to a report,

1. In the bottom part of the **Report Manager**, select the active report. The name of the active report is displayed in bold.
2. From the vertical toolbar, click on **Add composition**. A new composition named **Composition 1** appears in the bottom part of the window.
3. Select **Composition 1**.
4. In the top part, select a view and export it to the composition. .
5. The tree in the bottom part now show the view as an element of **Composition 1** .

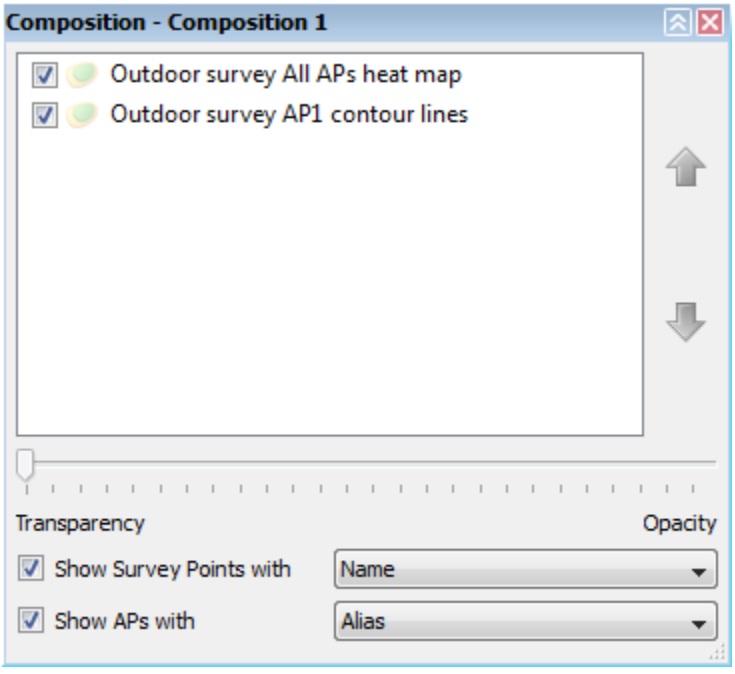
If you want to control precisely the properties of a compostion, you can use the **Composition** tool.

Composition Tool

The **Composition** tool is used to define the properities of the composition such as the stacking order of the views that make up the composition, their transparency level, as well as other display options. This tool is not visible by default, to show it:

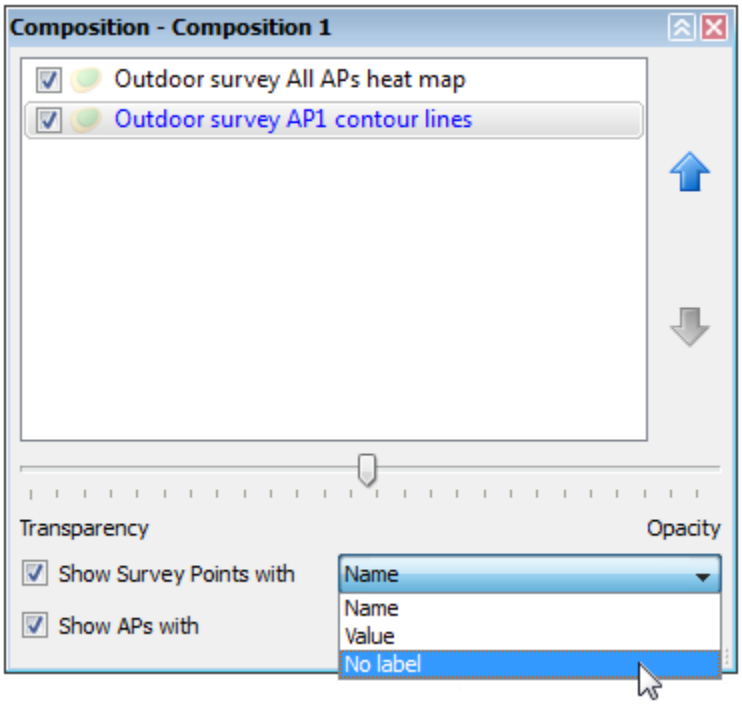
1. Make sure you are operating in report mode by clicking on the on **Report** in the mode tab.
2. Select **Tools** → **Composition** from the menu bar.

To activate this tool, you need to select a composition on the **Report Manager**, otherwise it will appear as disabled.

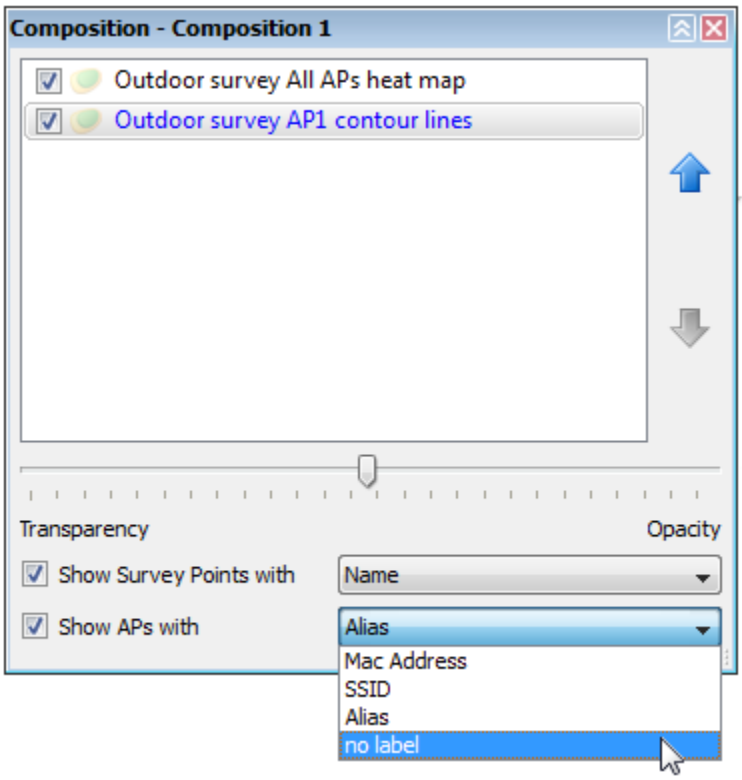


The slider sets the individual level of transparency of a view in the composition. With the two up/down arrows, you can modify the stacking order of the views in the composition. You can also completly hide a view by unchecking the associated check box.

You can configure if and how the survey points are displayed in the composition.



You can also configure if and the acess point icons should be displayed in the composition.



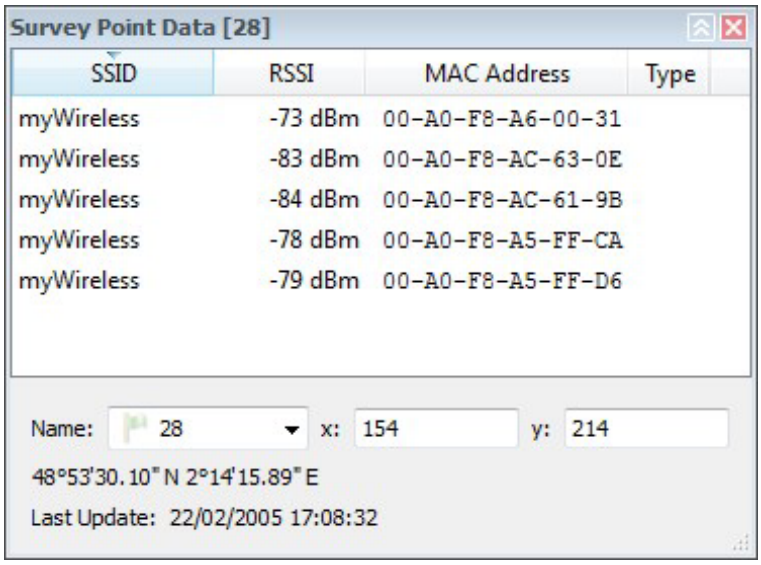
Common tools

The two following tools available in all of the three modes (Survey, View and Report mode):

- **Survey Point Data**.
- **Access Point Data**.

Survey Point Data

The **Survey Point Data** tool displays all the data recorded for the selected survey point as a list of access points. This data is recorded when the point is created or updated. To show this tool, select **Tools** → **Survey Point Data** from the menu bar. Alternatively, you can also double click on a survey point in the map area, or use the contextual menu of a survey point to open this tool.



Name — Name of the survey point. A number is assigned as the default name of a new survey point.

X,**Y** — Pixel coordinates of the survey point. If you modify these fields, the point will move accordingly in the map area.

When the map is geocalibrated, the latitude and longitude of the point are also displayed.

You can sort the list of access point by clicking on the headers. If you click on the column header with the right mouse button, you will be able to set which additional columns to show and which columns to hide. The list all available properties is given below.

Note

Certain properties are available only for the connected access point when the survey point was acquired. Moreover, optional IP layer measurements In this case the content column will be empty of these access points.

SSID — *Service Set Identifier* of the address (network name broadcasted by the access point).

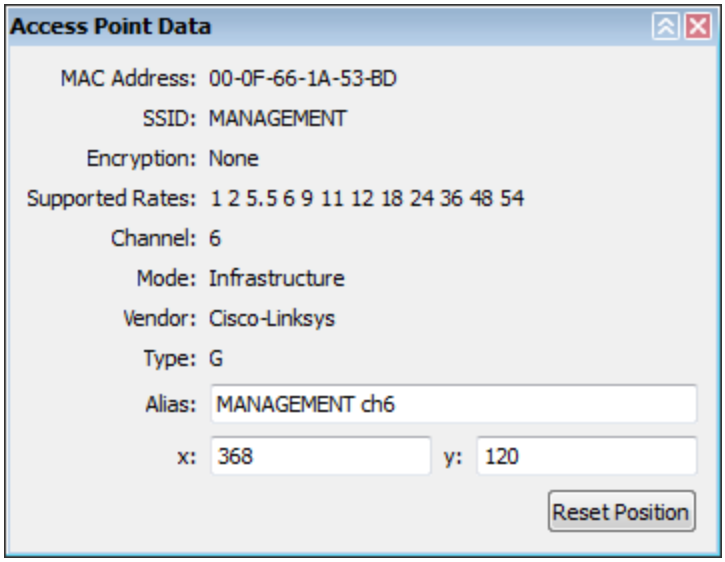
Mac Address — *MAC address* of the station.

Alias — user defined MAC address alias

Channel	radio channel number as per the 802.11 specification. • 1 to 14 for 2.4Ghz (depending on countries) • 34 to 161 for 5Ghz (depending on countries)
Type	type of network based on 802.11 specifications (`a`, `b`, `g` or `n`).
Max rate	maximum supported rate advertized by the station.
RSSI	Instant value of the RSSI (on beacons)
RSSI average	Moving average of the instant RSSI
RSSI connected	Instant RSSI on the network link (on network traffic)
Link Quality	only avaiable under Windows Vista
Mode	topology mode of the station (`Adhoc` or `Infrastructure`)
Vendor	manufacturer of the station, based on the first bytes of the MAC address declared with the IEEE.
Security	Security mechanism based on Wi-Fi Alliance terminology (`WEP`, `WPA Personal`, `WPA2 personal`, `WPA Enterprise`, `WPA2 enterprise`)
Cipher	Encryption cipher (`None`, `CCMP`, `TKIP`)
Authentication	Authentication and Key Management (`None`, `Pre-shared key`, `802.1X`)
Supported rates	list of all the supported rates advertized by this station.
Connected	Network connection was established with this access point when the survey point was recorded.
HTTP Throughput	throughtput measurement during a HTTP test (optional).
Iperf TCP Throughput	throughtput measurement during an TCP Iperf test (optional).
Iperf UDP Throughput	throughtput measurement during an UDP Iperf test (optional).
Iperf Jitter	jitter measurements (in ms) during an UDP Iperf test (optional).

Access Point Data

The **Access Point Data** dockable shows data recorded for an access point, or station in adhoc mode, identified by its MAC address. To show this tool, select **Tools** → **Access Point Data** from the menu bar. Alternatively, you can also double click on an access point icon in the map area.



Mac Address MAC address of the station.

SSID Network name broadcasted by the station.

Encryption authentication and encryption type. Possible values are:

`None`
`WEP`, `WPA Personal`, `WPA2 personal`
`WPA Enterprise`, `WPA2 enterprise`

Supported Rates Bit rates supported. In proposed example, access point support 1.0Mbit/sec 2.0Mbit/sec 5.5Mbit/sec ...

Channel Channel used by the access, it specify the frequency during wireless communication.

Mode Wireless network mode: infrastructure or ad hoc.

Vendor The hardware vendor, extracted from the Mac address.

Type Wireless network type: 802.11a/b/g/n

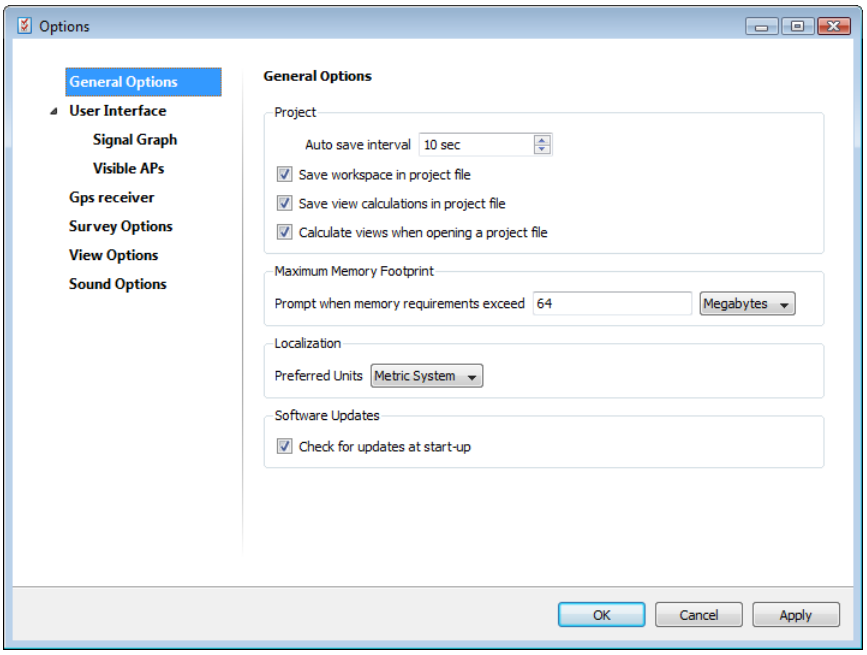
Alias Alias for this Mac Address. You can modify it by editing the content of this field.

X,**Y** Pixel coordinates of the stations. If you modify these values, the access point icon will move accordingly on the map area.

Locate Pressing this button will reset the position of the access point, and locate it where it was seen with the strongest RSSI.

Options

To open the option panel, use the menu bar **Tools** → **Options**



General options

Auto save interval

Your project data can be regularly saved in the background. In cash of a crash, you will have the opportunity to recover your data when re-launching Covera Zone. You can specify the interval (in seconds) between auto-save events.

If set to **Never** (0 sec), project data will not be automatically saved.

Save workspace in project file

If checked, Covera Zone will save your workspace state (dockable tools positions, dock areas, toolbars,...) to the project file. In this the case, the workspace is restored when you open the project file.

Save view calculations in project file

The results of the view calculations can be saved in the project. When the project is opened, all the views are restored without any calculations. This will increase the size of the project file but will save the calculation time.

Calculate views when opening a project file.

When a project file is opened, Covera Zone automatically start calculations to restore the views.

Prompt when memory requirements exceeds

The whole uncompressed image of the background map must fit into memory. This may cause your system to swap when very large images are imported. Covera Zone will show a warning message if the required memory exeeceds this limit. If you have enough memory on your system you can safely ignore this message or increase this value which is set to 64 Mbytes by default.

Preferred Units

Define whether the **Metric system** or **English units** should be used as default units for a new campagin.

Check for updates at start-up

If checked, Covera Zone will contact the update server on the Internet every time it launches. You will be notified if a new version is available.

User interface options

Main Window Title — This allows you to customize what is shown in the main Window title bar. You can use special keywords between curly brackets that will expand to the appropriate value.

`{appname}`	name of the application: *Covera Zone*
`{file}`	absolute path to the project file
`{*campaign*}`	Name of the campaign. * can represent any character(s) that will be printed only if there is a campaign is the project. When no campaign is defined, nothing is printed.
`{[campaign]}`	expands to *[my first campaign]*

Maximum projects to remember — Defines how many recently opened projects will be remembered in the **File** → **Recent projects** menu.

Clear History — Clear the history of recently opened projects.

Size of the Navigation Miniature — Set the size of the navigation miniature. Default value: 100 pixels.

Signal Graph

Show RSSI — Display the instant RSSI in the **Signal Graph** tool (as green bars)

Show RSSI moving average — Display the moving average of the RSSI in the the **Signal Graph** tool (as a yellow line).

Moving average on the last — Number of past measurements used to compute the moving average.

Show horizontal lines — Show or hide the horizontal lines of the signal graph grid.

Show vertical lines — Show or hide the vertical lines of the signal graph grid.

Visiable APs

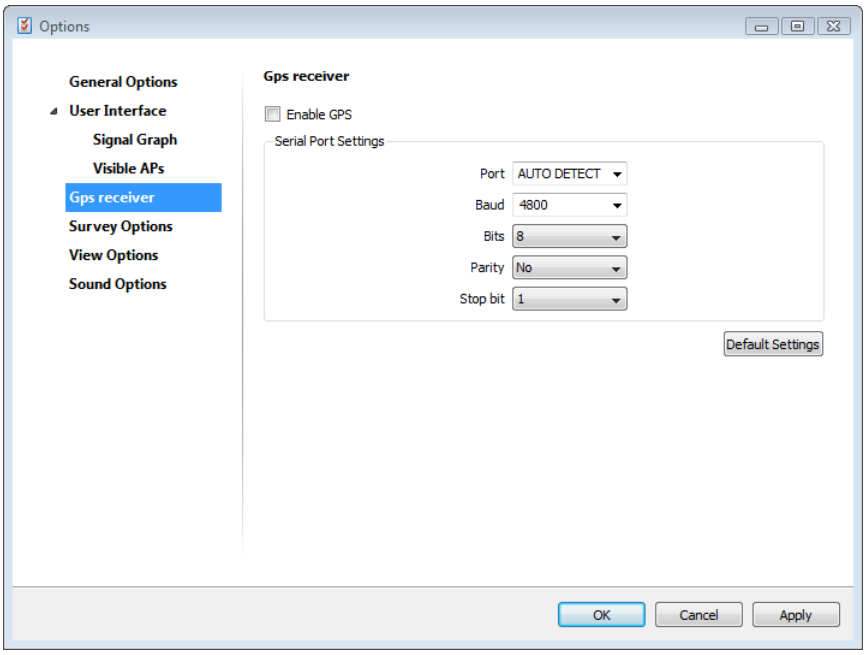
The string displayed in the title bar of the **Visible APs** can be customized using keywords.

Window Title

`{adapter}`	name of the current wireless device
`{naps}`	number of visible APs during the last scan on the current wireless device.

Gps receiver options

Covera Zone can get your position from a GPS receiver exporting *NMEA* messages over a serial port. To be able to use the GPS receiver, check the **Enable GPS receiver** box.



USB and Bluetooth GPS receivers are also supported via virtual serial ports. A virtual serial port is a software driver that will create a new serial port on your system, bridging USB/Bluetooth communication with the GPS receiver. Covera Zone will see this virtual port just like a "normal" serial port. Please check with your GPS manufacturer for the availability of a virtual serial port driver.

Port — Index of the serial port on your Windows system (COMx). If set to **AUTO DETECT**, then Covera Zone will try to detect on which port a GPS receiver is connected but trying to open every port and listen to NMEA compatible messages.

Baud — Set the baud rate (or speed) for the port. The default value is **4800**.

Bits — The default value is **8**.

Parity — Parity is a method of detecting some errors in transmission. The default value is **No**.

Stop bit — Stop bits are sent at the end of every byte transmitted in order to allow resynchronization. The default value is **1**.

The status of the GPS as well as your current position are displayed in the GPS tool.

Survey options

Scanning interval — Defines how often Covera Zone will ask the wireless device to scan the airwaves. Depending on the quality and responsiveness of your wireless device driver, you may want to decrease this interval to improve the quality of the scan results used by Covera Zone. The default value is 3 seconds.

Shutdown Zero Conf at start-up — This setting is only available under Windows XP. Zero Conf is the Windows XP service that manages your wireless connection. The wireless device driver may face too much pressure when both Cov-

era Zone and Zero Conf ask to scan. Shuting down Zero Conf will release this pressure, and improve the quality of the scans reported by Covera Zone.

Automatic MAC address alias This mask is used to automatically create an alias for a newly detected MAC address. It may mix the follwing data:

- `{ssid}` expands to the SSID of the access point identified by the MAC address
- `{channel}` expands to channel used by the station identified by the MAC addres
- `{vendor}` expands to name of the vendor (Organizational Unique Identified found in the MAC address)

Sound options

Covera Zone can play WAV sounds on various events.

Play sound on handover If checked, Covera Zone will play the sound defined by **File** when the wireless device is switching to a different Access Point on the same network (same SSID, different MAC).

Play sound when joining a new network If checked, Covera Zone will play the sound defined by **File** when the wireless device is associating to a new SSID (SSID changes from the current one).

Play sound when adding a GPS point If checked, Covera Zone will play the sound defined by **File** when a new survey point is automatically added to the project (only when the GPS automatic mode is enabled) See the section called “GPS” [56].

Chase AP Defines the sound file played when an access point is being chased. See the section called “ Chase AP ” [55].

Chapter 5. How to?

Table of Contents

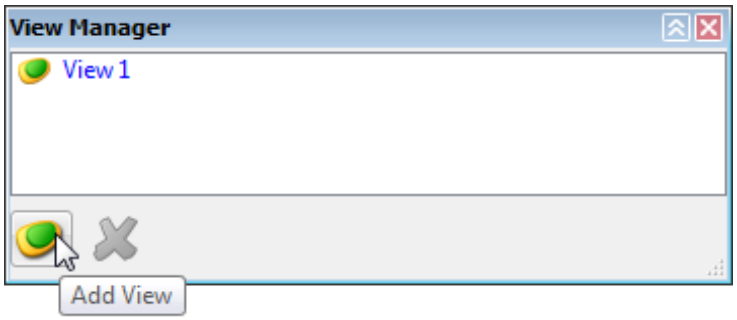
How to visualize the coverage of an access point? 91
How to locate stations on the map? 98
How to merge survey points from two different projects? 100
How to set-up a GPS receiver? 100
How to measure HTTP throughput? 103
How to make Iperf measurements? 106
How to georeference a map? 109

How to visualize the coverage of an access point?

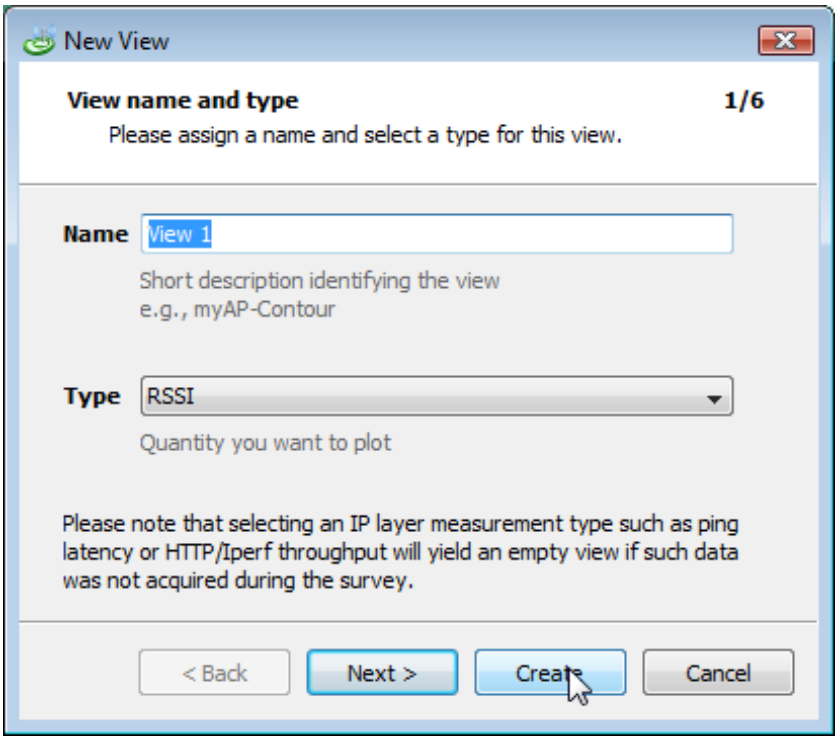
You can easily create a view to determine the coverage area at -70 dBm of an existing access point.

We suppose that you already have a campaign with several survey points. If it is not the case, you can use one of the sample projet files stored in `Samples` subfolder, in the Covera Zone installation folder.

1. First, switch to **View Mode** and create a RSSI view using the **View Manager**.



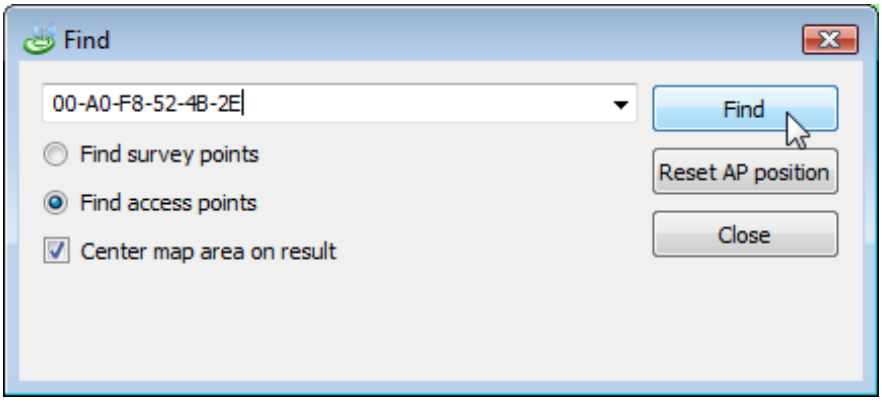
   a. Click on the **Add** button. The **Add View** dialog will show up.


New View
View name and type
1/6
Please assign a name and select a type for this view.
Name
View 1
Short description identifying the view
e.g., myAP-Contour
Type
RSSI
Quantity you want to plot
Please note that selecting an IP layer measurement type such as ping latency or HTTP/Iperf throughput will yield an empty view if such data was not acquired during the survey.
< Back
Next >
Create
Cancel

b. Keep the default values **`View 1`** and **`RSSI`** and click on **Create**.

2. To display an access point icon on the map, you are going to use the **Find** dialog.

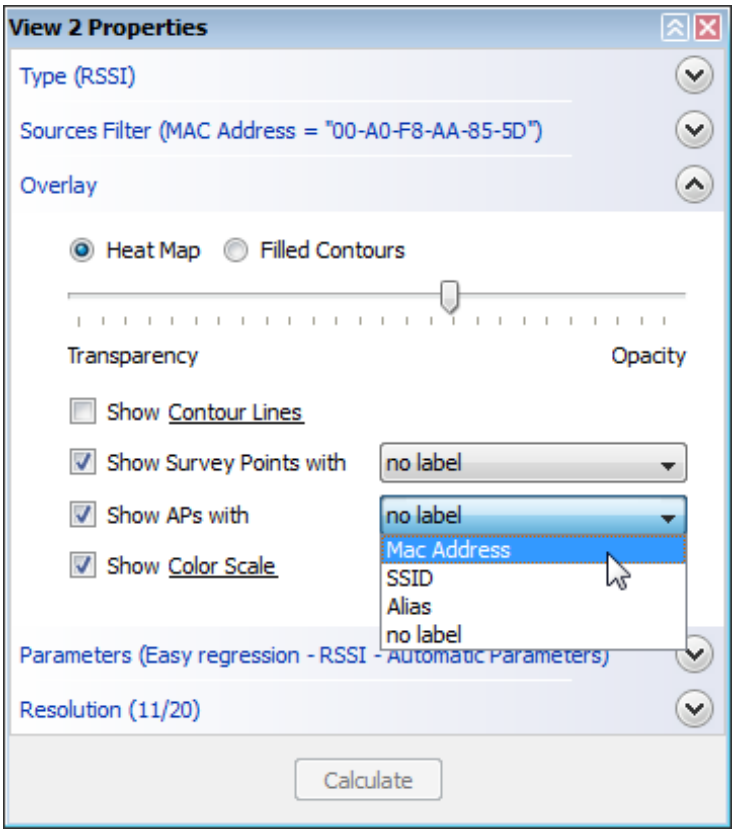
a. Select **Edit** → **Find** or use the keyboard shortcut **Ctrl+F**.



b. Check **Find Access Point** and select the access point in the drop down list.

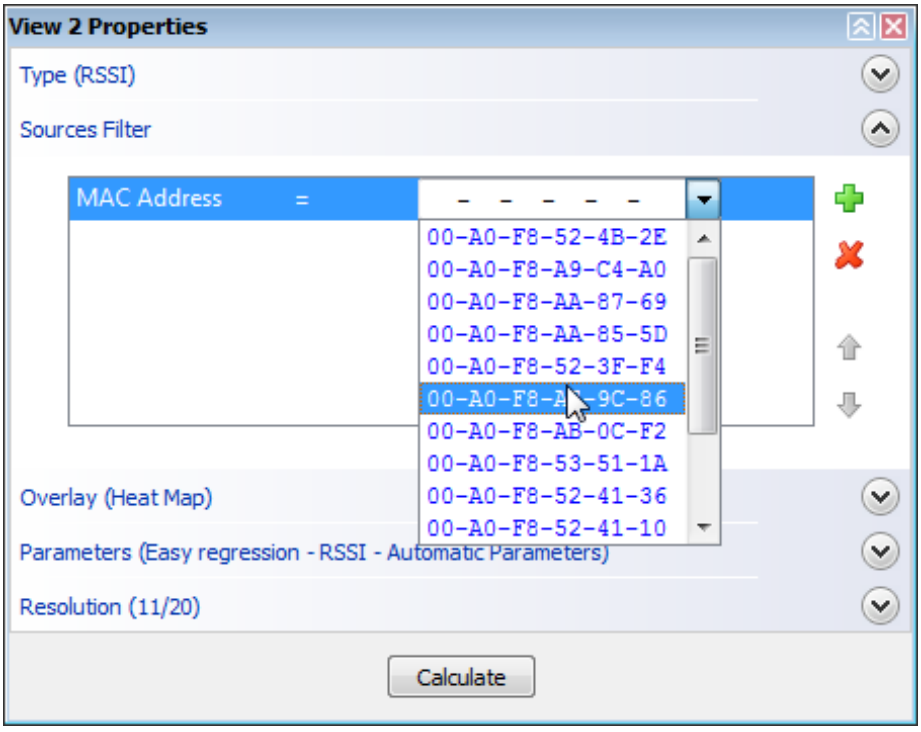
c. Check the **Center map area on result** box then press **Find**.

d. Select **Show Stations with Mac Address** in the **Overlay** section of the **View Properties** tool (click on the **Overlay** label to expand/collapse the section).

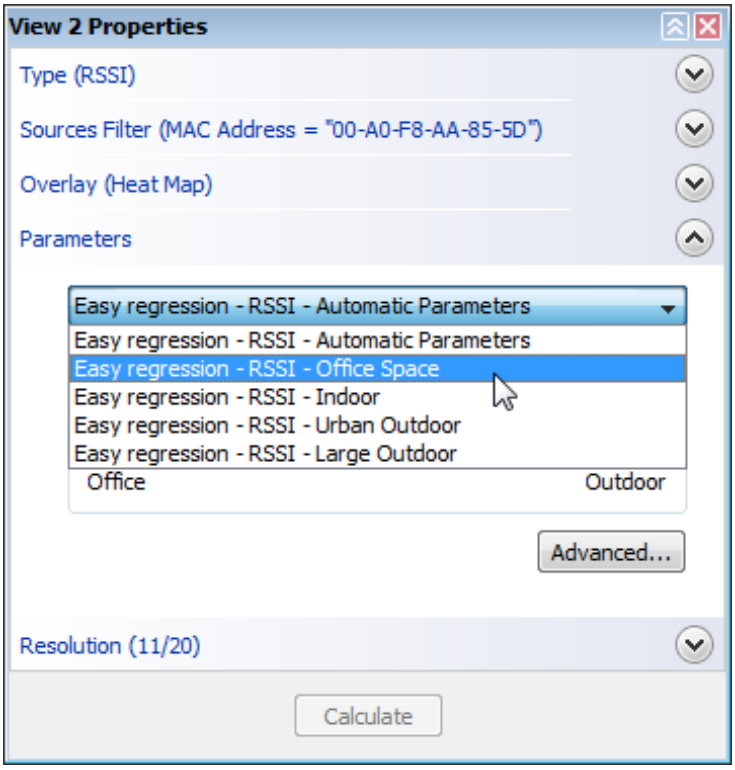


3. We are now going to edit the view properties in order to calculate a the RSSI value for our chosen access point.

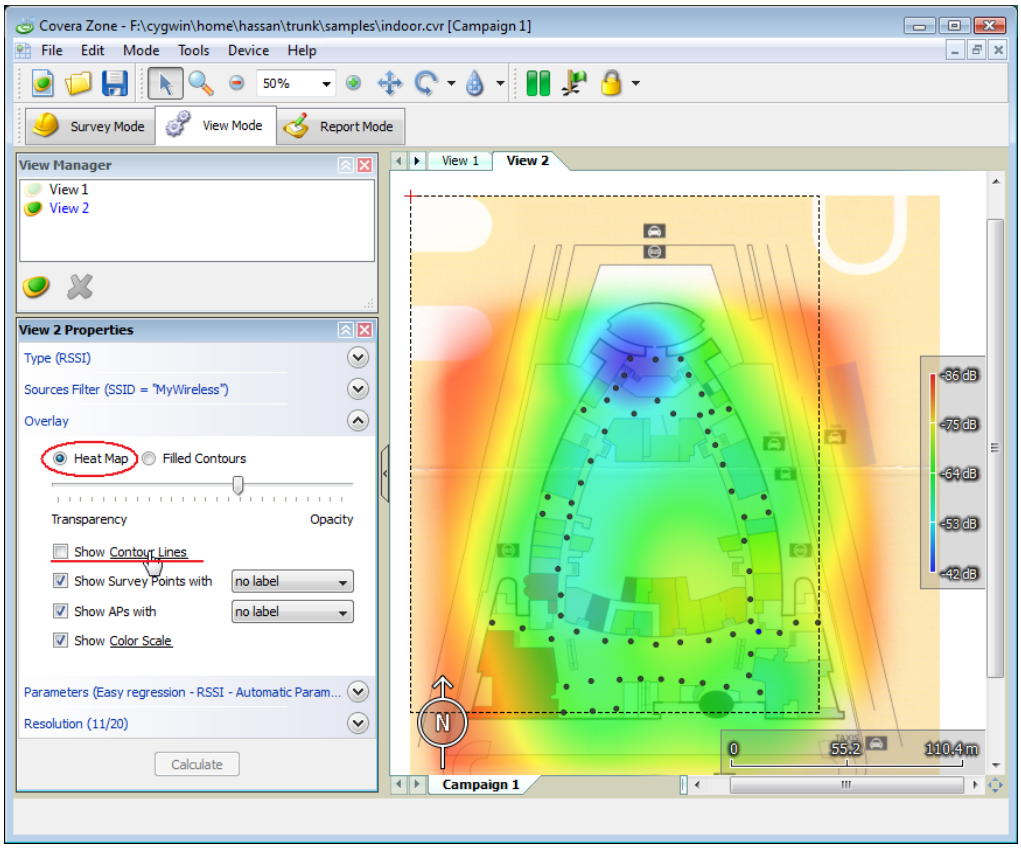
   a. Select the MAC address of the access point in the **Source** section of the the **View Properties** tool.



b. Adjust the view parameters. You can choose a predefined profile from the drop down list.

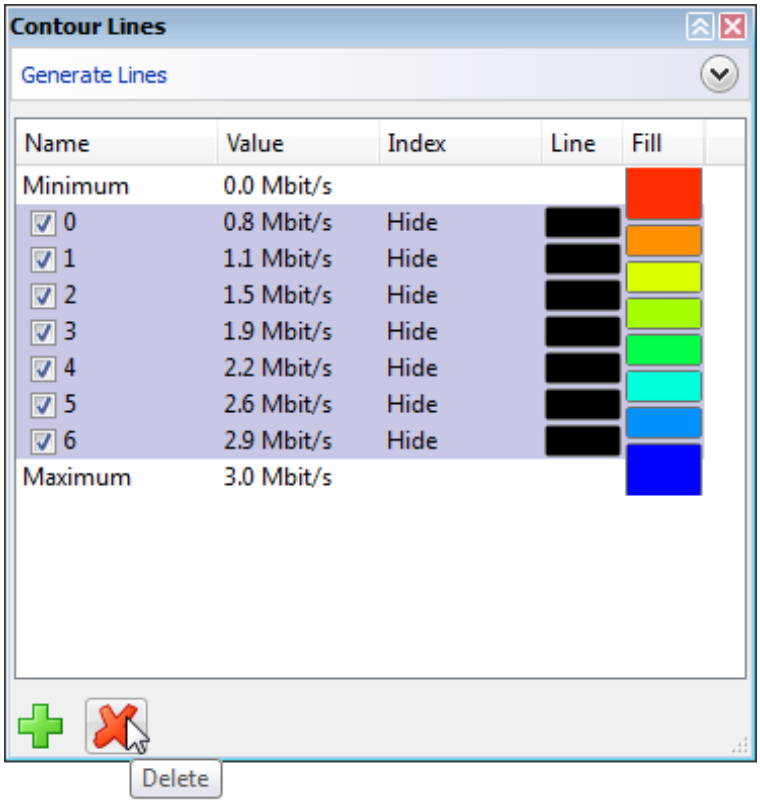


c. Click on the **Calculate** button. When the calculation is finished, you should see a heat map representation of the coverage area.



4. To determine the coverage area at -70 dBm, we can create our own contour line that, when filled, will give us the desired area.

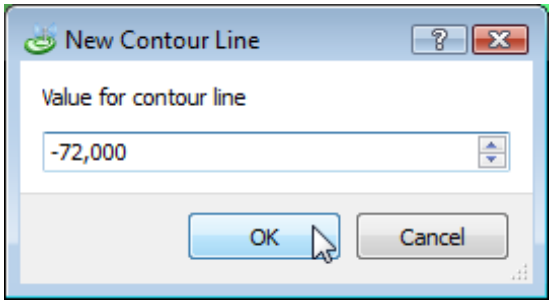
    a. Open the **Contour Lines** tool by using the **Tools** menu or by clicking on the **Contour Lines** link in the **View Properties** tool.



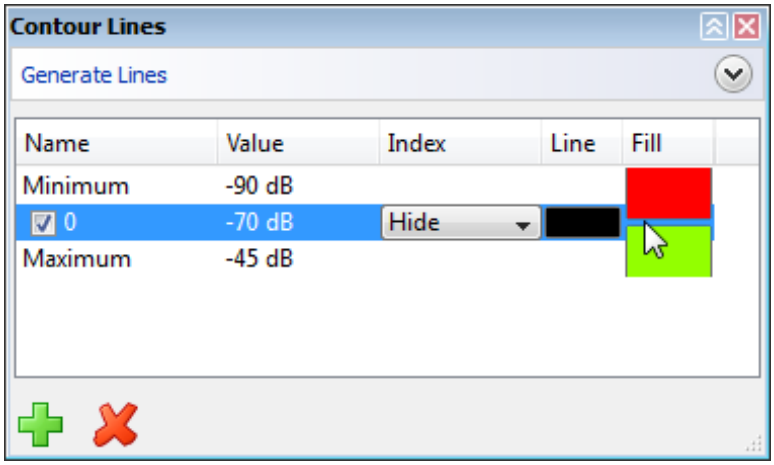
b. Select all the precalculated contour lines and delete them with the **Delete** button. To select all the contour lines, you can use one of the following methods:

- Click on the first contour line, press and hold down the **Shift** key while you click the last contour line.
- Press and hold down the **Ctrl** key while you click all the contour lines.
- Drag the mouse over all the contour lines.

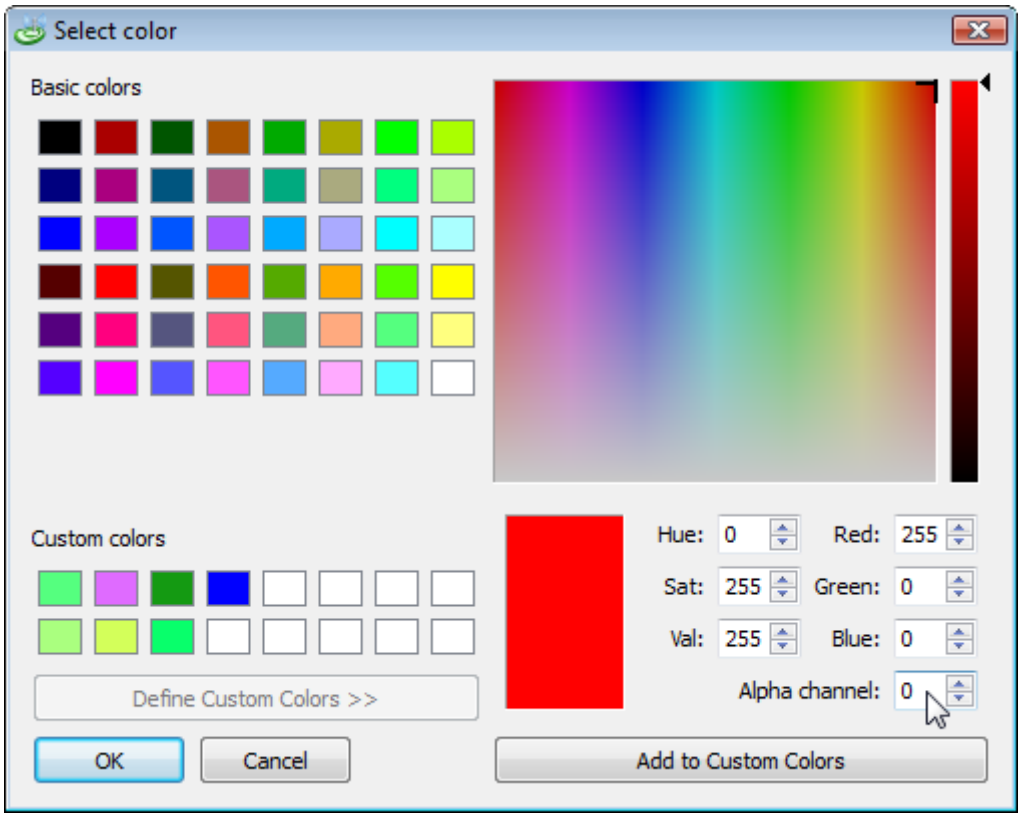
c. Click on the **Add** button. The **New Contour Line** dialog will show up.



d. Enter the value -70 then click **OK**.



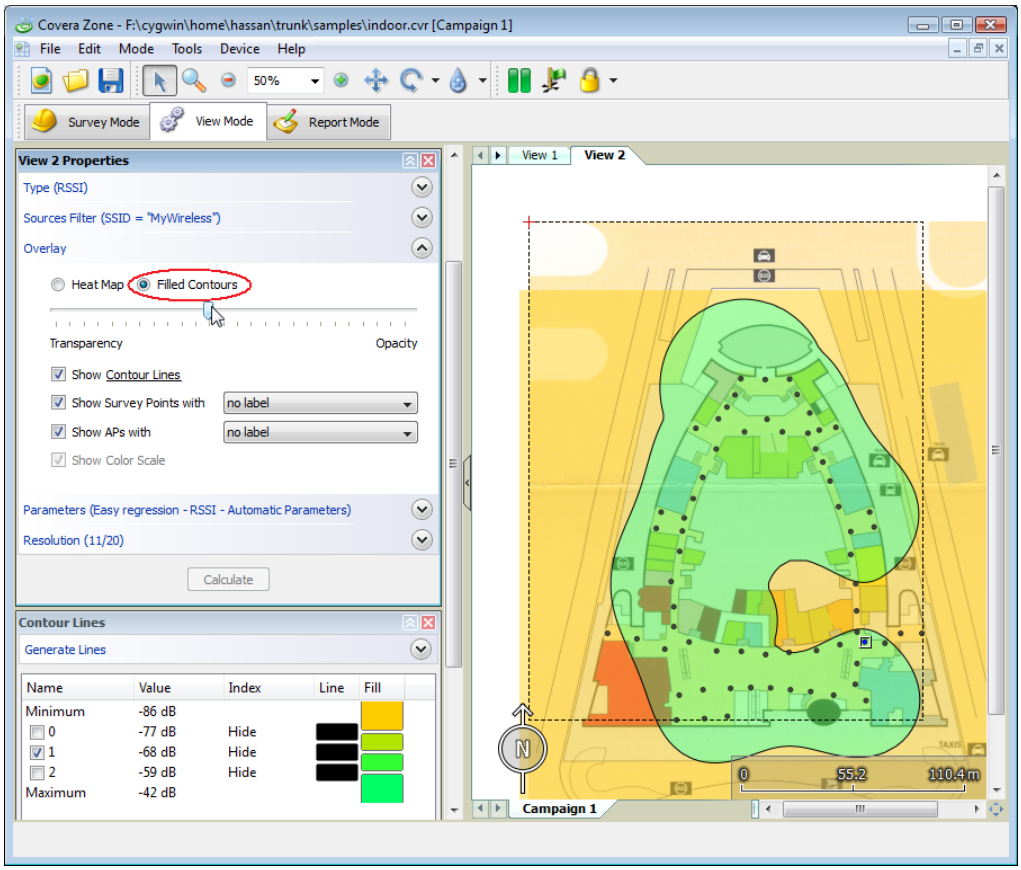
e. A new contour line is added. To disable filling the region where the RSSI is lower to -70 dBm, we set the corresponding fill color (the red color in our case) to fully transparent. Click the corresponding color button in the **Fill** column on the **Contour lines** tool.



f. Set **Alpha channel** value to 0 then click **OK**.

g. Check the **Draw Contour Lines** box and select **Filled Contours** in the **Overlay** section of the **View Properties** tool.

You can also choose to show or hide the survey points using the **Show Survey Points** box, and adjust the opacity of the filled contour using the transparency slider.



How to locate stations on the map?

Covera Zone can show an icon on the map area for every known stations. By default, the station icon is displayed on the survey point where the signal from this station is the strongest. You can manually move this icon if you kown the exact position the station.

1. We need first to create a simple campaign with some dummy data:

   a. Make sure you are in Survey Mode by clickin on the tab bar.

   b. From the menu, **Mode** → **Survey Mode** → **Add Campagin**

   c. We do not need a background image for this dummy campaign. In the **Add Campagin** dialog, just click on the **OK** button.

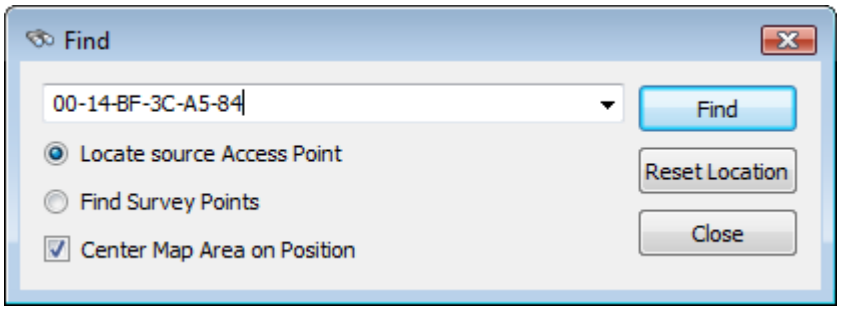
   d. In the toolbar, select the **Add survey point** tool.

   e. Now take a few survey points by clicking on the map area.

   When you took this survey point, you have probably recorded the signal of some stations.

2. From the menu, select **Edit** → **Find**.

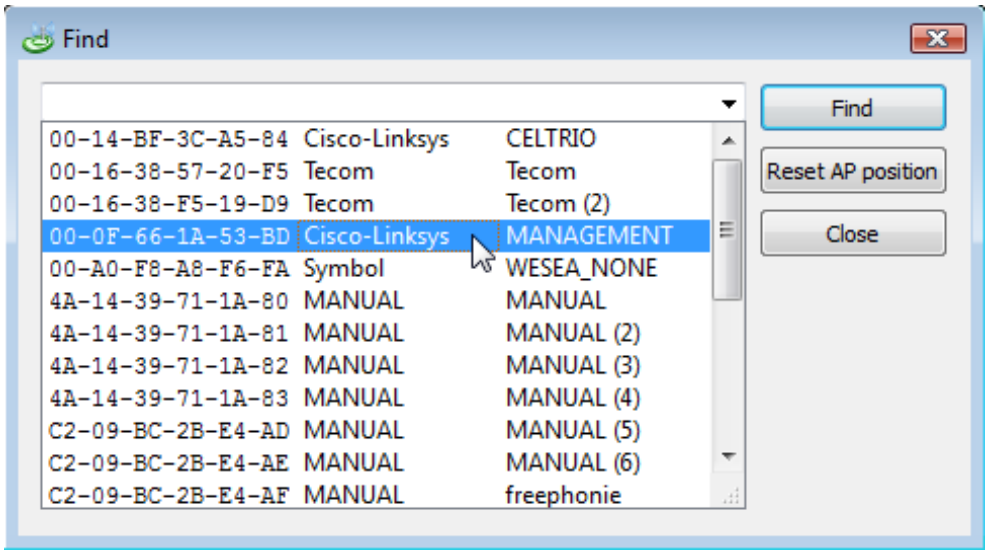
3. In the **Find** dialog, check the **Find access point** radio button.



- You can also display the dialog by pressing **Ctl**+**F** on the keyboard.

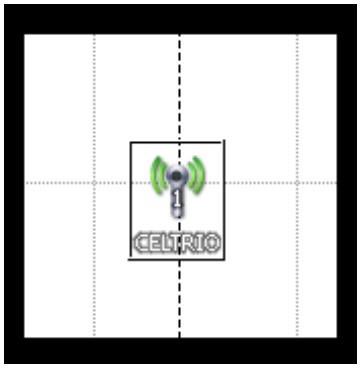
4. Check **Center map area on result**

5. Now select the Mac address of the station you want to locate in the drop drop menu. When opened, you can resize the menu by gradding its bottom right corner.



6. Click on the **OK** button.

7. In the map aera, you will see a station icon.



If you double click on this icon, you will see the Access Point Data.

How to merge survey points from two different projects?

For large site surveys, you can save time by working in parallel to gather survey data. Two persons with two survey machines can explore different areas of the netwrok under test and merge their data in a single project afterwards.

This is easily done using copy/paste.

1. Open the two projects you want to merge in two different Covera Zone windows. Let's call them project A and project B.

2. Select the survey points you want to merge in project A.

3. In the project B window, simply paste the points.

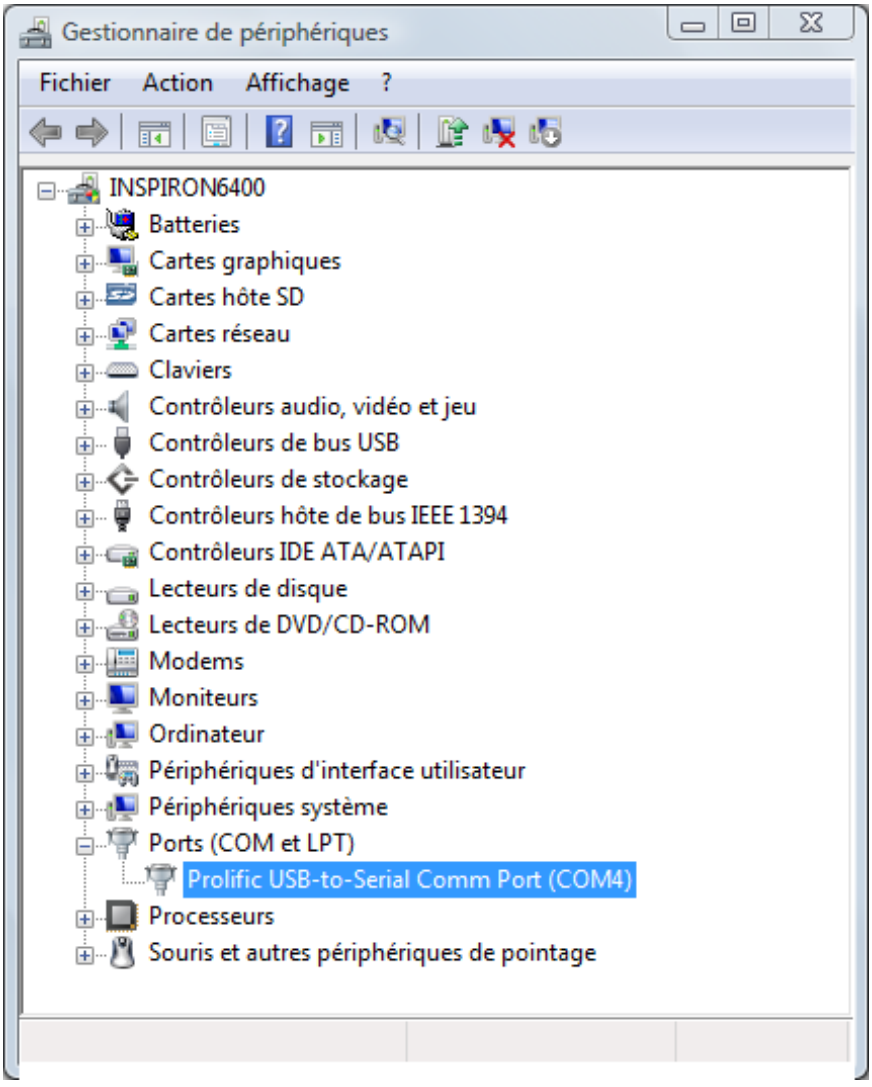
Scaled projects should share the same background image. This is not required for georeferenced campaigns.

How to set-up a GPS receiver?

Covera Zone supports GPS receivers exporting NMEA messages over a serial port. The serial port can be a normal physical serial port, or virtual serial port for USB and Bluetooth GPS receivers. In this case, you will have to install additional software provided with the GPS receiver. Please refer to your GPS receiver documentation.

The first step is to determine the port number (COMx) for your physical or virtual serial port. Under Windows XP, you can follow this procedure:

1. In Windows XP, select **Start** → **Control Panel**.
2. Click on the **System** icon.
3. Select the **Hardware** tab.
4. Press on the **Device Manager** button.
5. In the tree list showing all the devices, open the **Ports (COM & LPT)** branch.



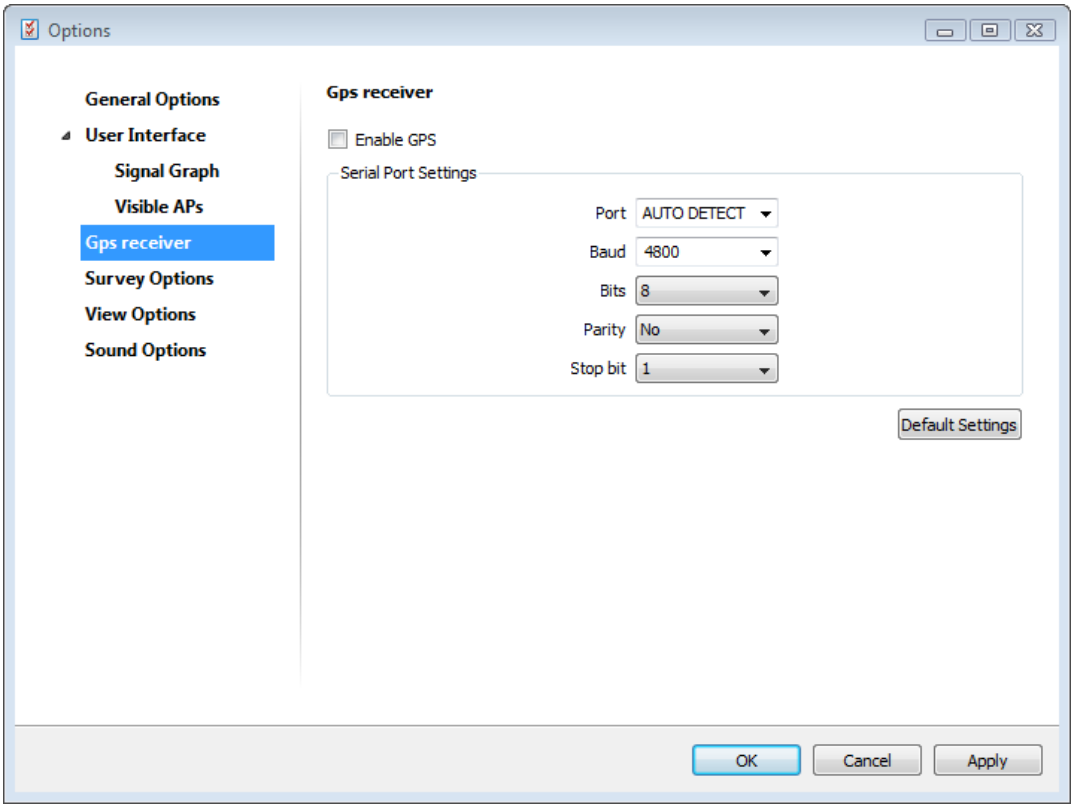
6. Identify the serial port used by the GPS and note down the port number x (COMx). In this example, a virtual port is created on COM4 for a USB GPS.

Now, we can configure Covera Zone.

1. Launch **Covera Zone**.

2. Select **Tools** → **Options** from the menu.

3. Select the **GPS receiver** branch.



4. Check the **Enable GPS** checkbox.

5. Enter the port number in the **Port** field. You can usually keep the default values for the other settings.

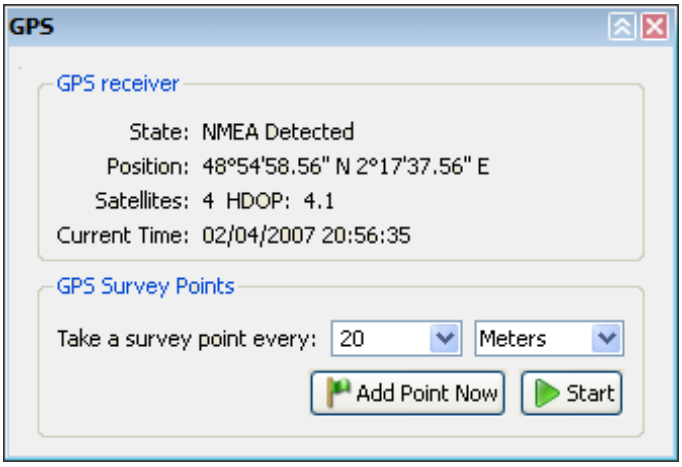
6. Click on the **OK** button.

We can now check that the GPS receiver has been succefully detected.

1. Switch to **Survey Mode** by clicking in the tab bar.

2. From the menu, select **Tools** → **GPS**.

3. After some time required for the GPS receiver to start-up (up to a few minutes), you should see something like this:



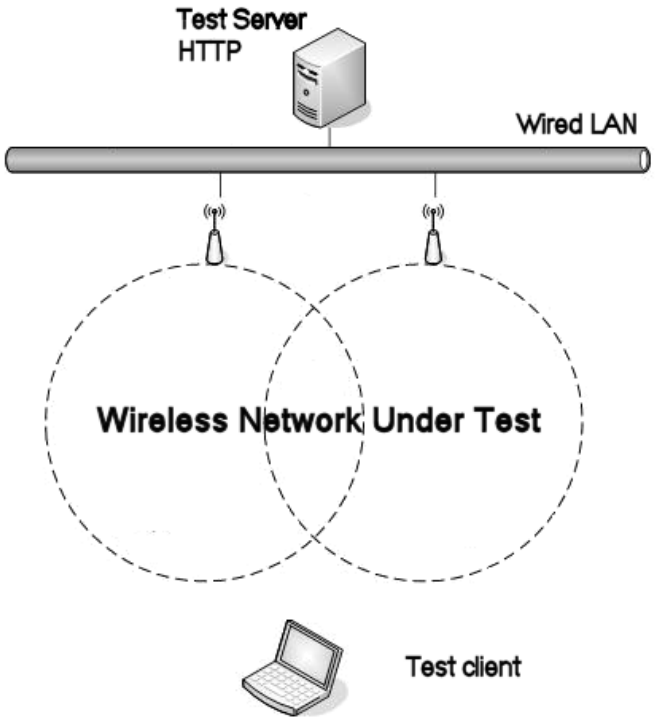
How to measure HTTP throughput?

Your wireless infrastructure may be rated at 11Mbps or 54Mbps, it is not the throughput that network users will experience. These figures give the raw capacity at the wireless physical layer. When a network application sends traffic on the wireless network, this traffic traverses the full protocol stack Physical/MAC/IP/TCP or UDP. Each layer introduces an overhead. In the case of a web client, if you measure the payload throughtput at the HTTP level, you will find a much lower data rate that the advertized physical data rate. We give here below the theoritical maximum HTTP throughput for a 802.11b network employing short preamble.

Physical data rate	TCP throughput	Efficiency
Mbit/s	Mbit/s	
1	0.77	76.9%
2	1.49	74.3%
5.5	3.83	69.6%
11	6.52	59.3%

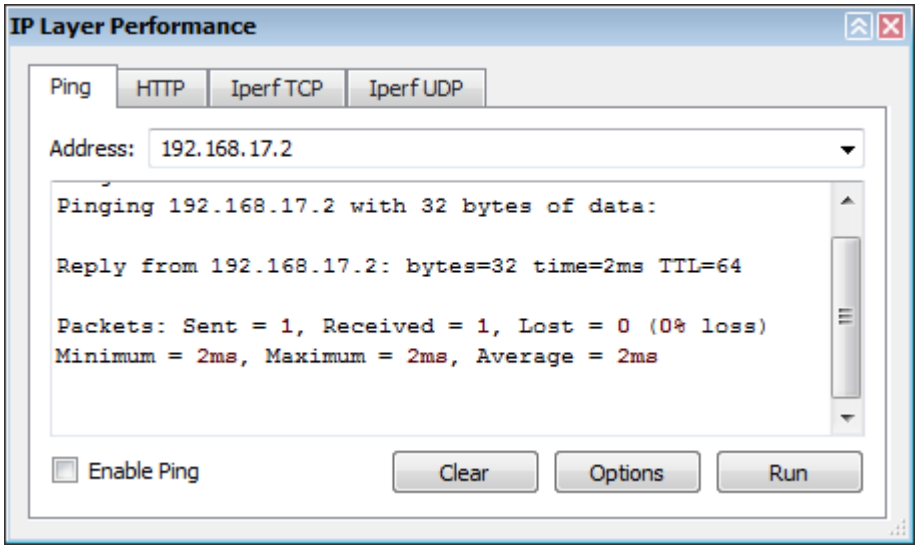
With Covera Zone you can make several application level measurements. We are going to explore the simplest throughput test: HTTP. To do that, you will need a server running a HTTP daemon. Covera Zone will use its embedded HTTP client to fetch a file from the test server throught the wireless network under test, and calculate the observed HTTP throughtput from that.

To measure the performance on the wirelss segment of your network, make sure the Test client is as close as possible to the HTTP test server (in terms of network topology). The wireless access points and the test server should be all connected to same Ethernet switch.



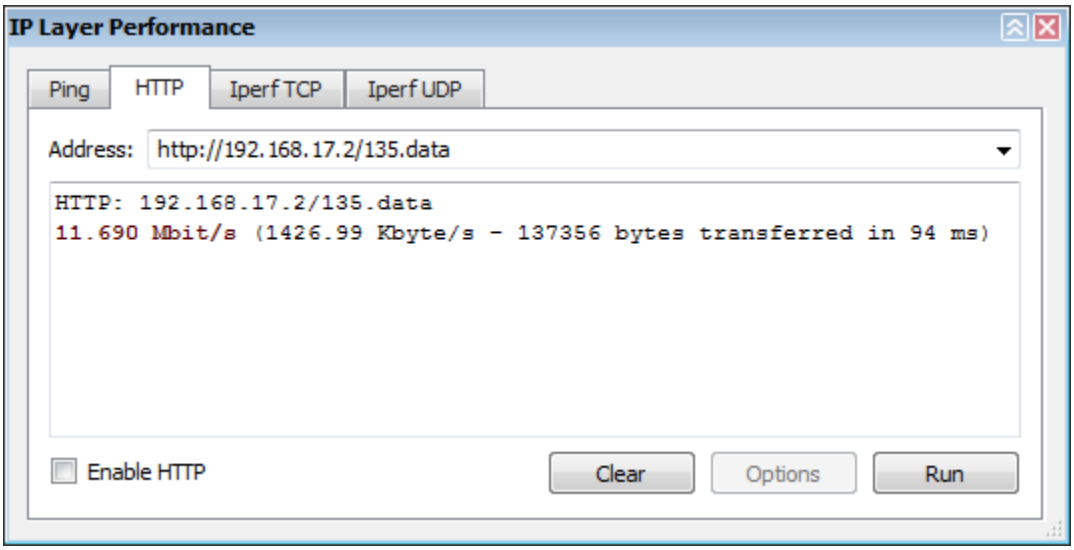
1. From the menu, select **Tools → IP Layer Performance**

   The corresponding tool window will show up.

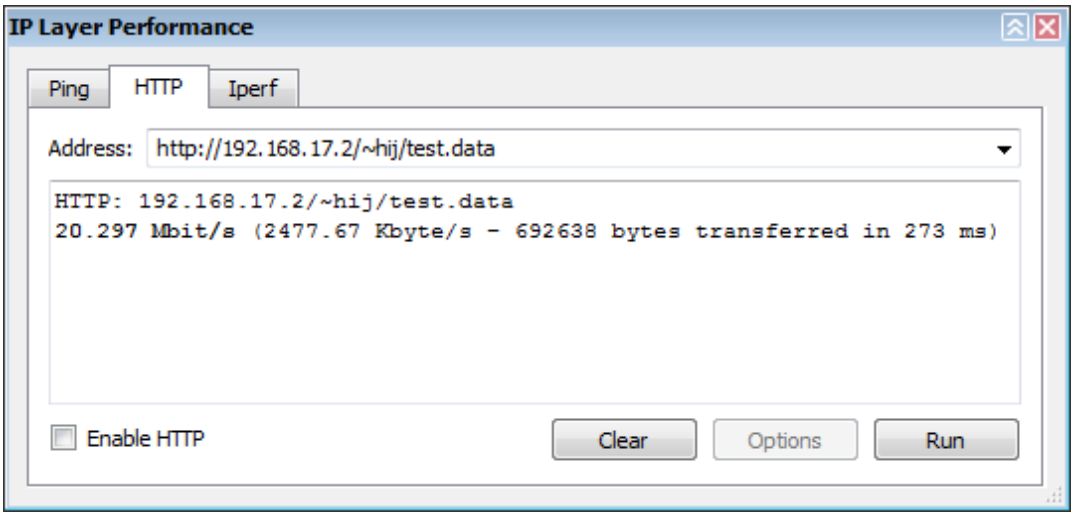


2. Select the **HTTP** tab.

3. Enter the full URL to your test file on the test server. On Celtrio's test network, it is **`http://192.168.17.2/test.data`**.

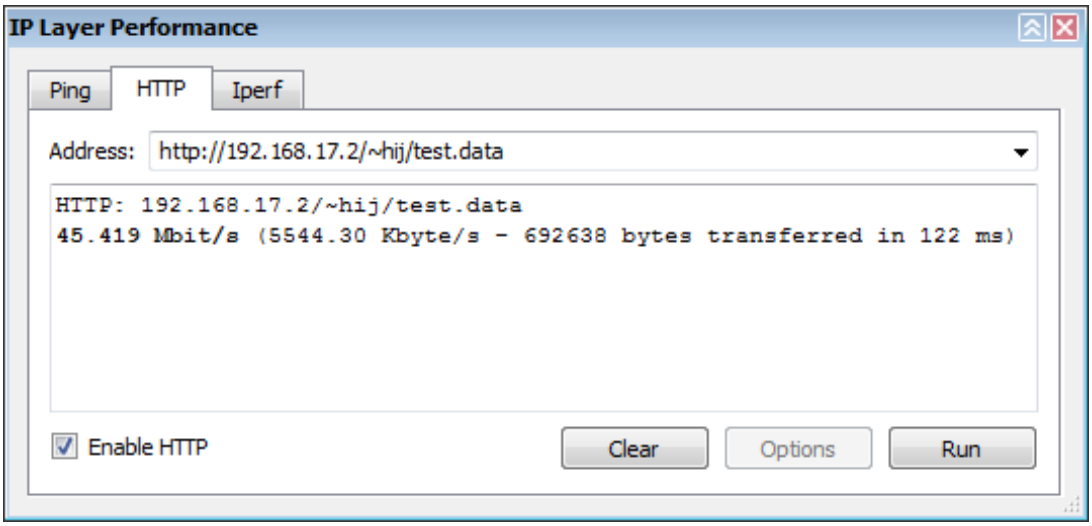


4. Press on **Run** and observe the output in the console.



If you make the same several times by pressing **Run**, you will notice some random variability in the result. A large test file will give more repetable measurements but entails a longer measurement. Choosing the right size for your test file is a matter of compromise between these two factors. Covera Zone will refuse files smaller than 64Kbyte. We recommand using a file at least 1 MByte.

Because the HTTP test takes some time to complete, it is not enabled by default when you make a new survey point on the map. If you want to run a HTTP for each survey point, just check the **Enabled** check box.



Note

- Make sure there is no throttling in your network.
- Make sure there is not firewall or port blocking to access the test server on port 80.
- If you have several network interface on the test client, make sure only the wirelss interface is activated. Otherwise, you may measure throughput on a different interface.

How to make Iperf measurements?

In a wireless network, the following factors may cause much lower IP throughput than the advertised link speed:

- Protocol overhead.
- Retransmission of lost or corrupt packets (at the TCP level, or the 802.11 MAC level)
- collision avoidance in 802.11MAC may cause "back off" waiting time and retransmission

Iperf is a free commmand line tool for measuring TCP and UDP throughput performance in a client/server set-up. Covera Zone contains an embedded Iperf client to make measurements against a test Iperf server. To run an Iperf test you will need:

- A Windows machine with a wireless connection to the wireless network under test and running Covera Zone.
- A test server (Linux or Windows) with a wired connection to the wireless network under test. Ideally, the server is plugged on the same Ethernet switch as the access points.

We are now going to prepare the Iperf server for a TCP test that will simulate typical data application traffic (like Web or Mail traffic).

1. Download Iperf from http://dast.nlanr.net/Projects/Iperf/ and install it on your test server (Windows or Linux).

2. On the server machine, type the following command to start the iperf server:

```
bash #iperf --server --port 5001 --interval 1
------------------------------------------------------------
Server listening on TCP port 5001
TCP windows size: 85.3 KByte (default)
------------------------------------------------------------
```

   If you want to use a different port, replace 5001 with the desired port number.

3. The Iperf server is now waiting for a connection from a test client. Make sure the firewall on the test server will allow TCP traffic on port 5001.

On the test machine running Covera Zone:

1. From the menu, select **Tools** → **IP Layer Performance**.

2. Press the **Iperf** tab.

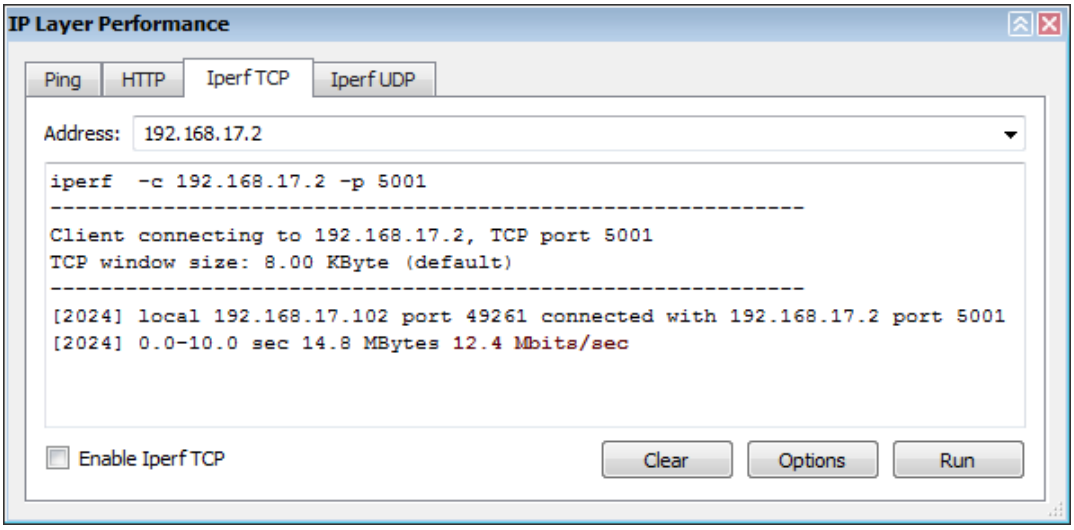
3. Set the address of the server in the **Address** field. In our case **192.168.17.2**.

4. Press the **Run** button.

5. At the server side, observe the client connection:

```
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[  4] local 192.168.17.2 port 5001 connected with 192.168.17.105 port 4488
[  4]  0.0- 1.0 sec    888 KBytes  7.27 Mbits/sec
[  4]  1.0- 2.0 sec    888 KBytes  7.27 Mbits/sec
[  4]  2.0- 3.0 sec  1.00 MBytes  8.42 Mbits/sec
[  4]  3.0- 4.0 sec  1.43 MBytes  12.0 Mbits/sec
[  4]  4.0- 5.0 sec  1.77 MBytes  14.8 Mbits/sec
[  4]  5.0- 6.0 sec  1.46 MBytes  12.2 Mbits/sec
[  4]  6.0- 7.0 sec  1.65 MBytes  13.8 Mbits/sec
[  4]  7.0- 8.0 sec  1.28 MBytes  10.7 Mbits/sec
[  4]  8.0- 9.0 sec  1.17 MBytes  9.84 Mbits/sec
[  4]  9.0-10.0 sec  1.01 MBytes  8.47 Mbits/sec
[  4]  0.0-10.0 sec  12.5 MBytes  10.5 Mbits/sec
```

   The result in the Covera Zone Iperf client is:



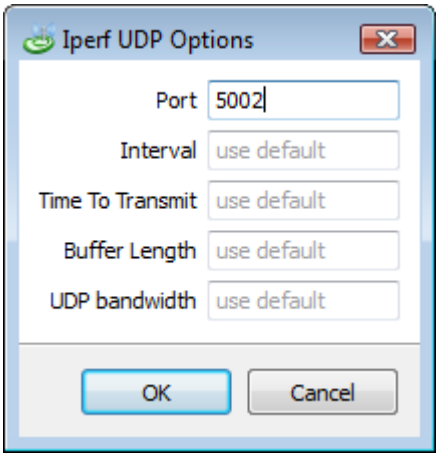
We can also use Iperf to generate UDP traffic that will simulate real-time voice traffic.

1. On the server side, stop the server with **Ctrl**+**C** and restart it with the following options:

```
bash #iperf --server --port 5001 --udp
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:   107 KByte (default)
------------------------------------------------------------
```

2. In Covera Zone, at the client side, click on the **Options** button.

3. In the **Options** dialog:



   a. Check the **UDP** radio button.

   b. Set the **UDP Bandwith** field to 50m for 50Mbit/s.

      We want to estimate the maximum throughput on the wireless network. That's why we should set **UDP Bandwidth** greater than the maximum throughput expected on the network. If this setting is too small, Iperf will just confirm that the defined amount of UDP packet have gone through without problem, without stressing the network.

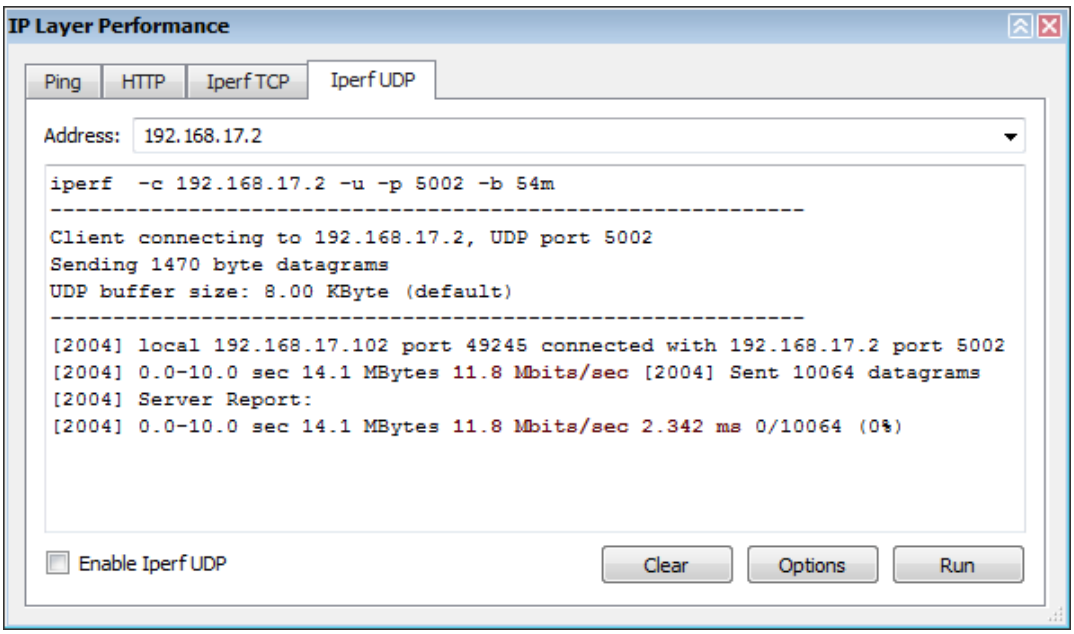
   c. Click on the **OK** button.

4. Make sure the server's firewall allows UDP traffic on port 5001 and press **Run**.

5. At the server side, you will see something like this:

```
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:   107 KByte (default)
------------------------------------------------------------
[  3] local 192.168.17.2 port 5001 connected with 192.168.17.105 port 1138
[  3]  0.0-10.0 sec  14.1 MBytes  11.9 Mbits/sec  2.569 ms    0/10072 (0%)
[  3]  0.0-10.0 sec  1 datagrams received out-of-order
```

...and in Covera Zone, on the client machine:


IP Layer Performance
Ping
HTTP
Iperf TCP
Iperf UDP
Address:
192.168.17.2
iperf -c 192.168.17.2 -u -p 5002 -b 54m
Client connecting to 192.168.17.2, UDP port 5002
Sending 1470 byte datagrams
UDP buffer size: 8.00 KByte (default)
[2004] local 192.168.17.102 port 49245 connected with 192.168.17.2 port 5002
[2004] 0.0-10.0 sec 14.1 MBytes 11.8 Mbits/sec [2004] Sent 10064 datagrams
[2004] Server Report:
[2004] 0.0-10.0 sec 14.1 MBytes 11.8 Mbits/sec 2.342 ms 0/10064 (0%)
Enable Iperf UDP
Clear
Options
Run

How to georeference a map?

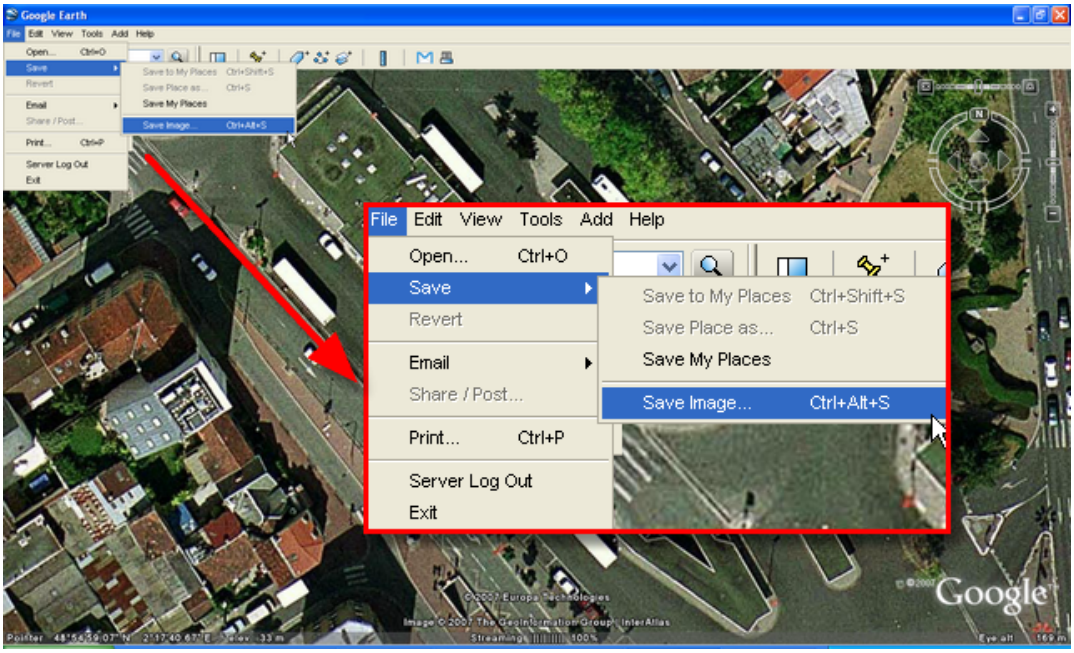
Georeferencing a map will allow Covera Zone to locate your current position on the map, from the information provided by a GPS receiver. This is useful for outdoor surveys. In this section, we will assume that you are using Google Earth to obtain high resolution aerial images.

1. If **Google Earth** is not installed on your machine, you can download it from http://earth.google.com.

   a. Launch **Google Earth** and navigate to the place you want to survey.

   b. Set the Zoom factor so that the area of interest is taken the whole screen.

   c. The save an image **File** → **Save** → **Save Image...**



2. Create a new **Covera Zone** campaign with this image.

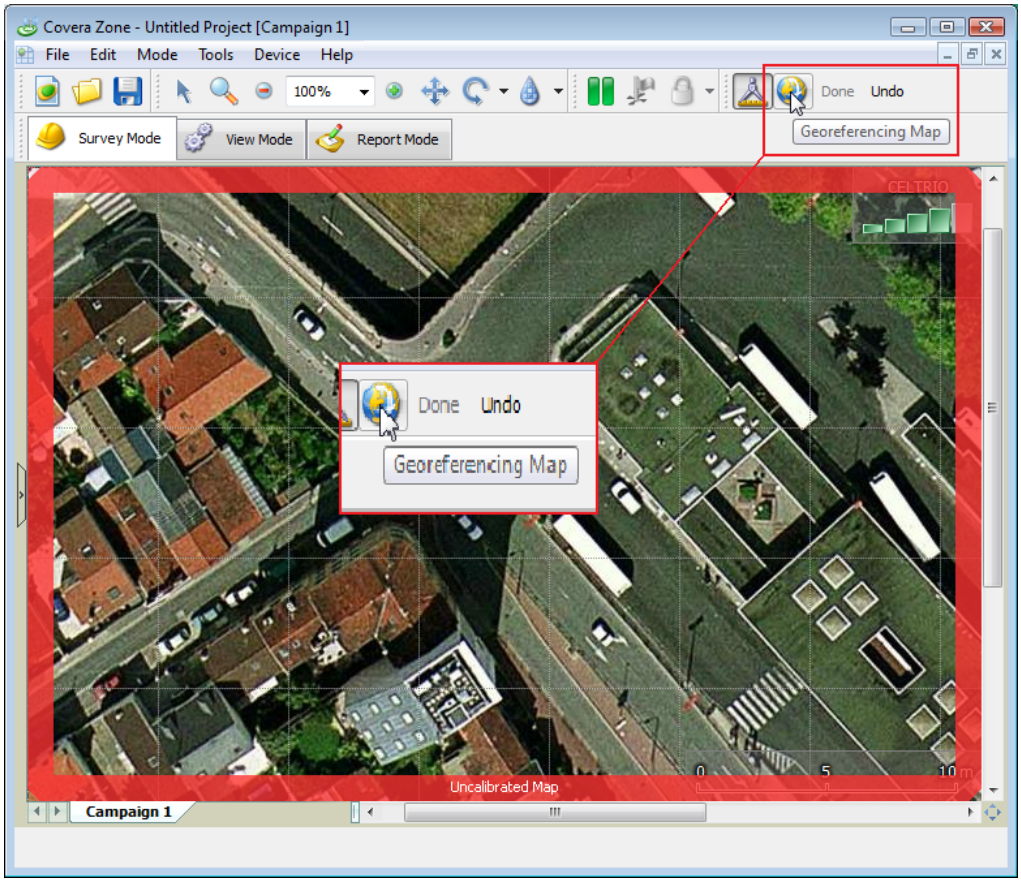
    a. Launch **Covera Zone**.

    b. Click on the **Add Campaign**.

    c. In the **Add Campaign** wizard, press **Browse**.

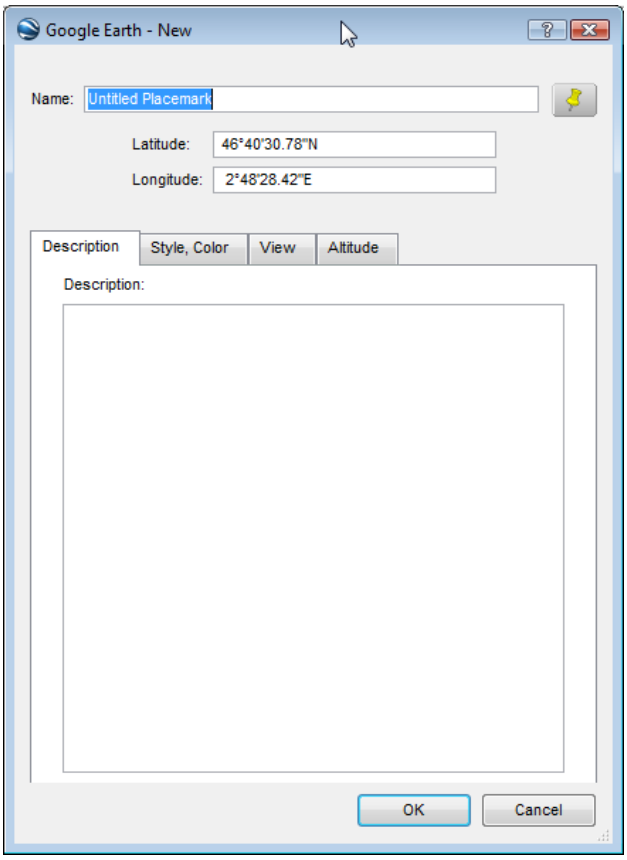
    d. Select your file, and press **Open**

    e. In Covera Zone's calibration toolbar, select the **Georeferencing map** tool.



3. We are now going to geocalibrate this map by placing two reference points with known coordinates, on the Covera Zone map.

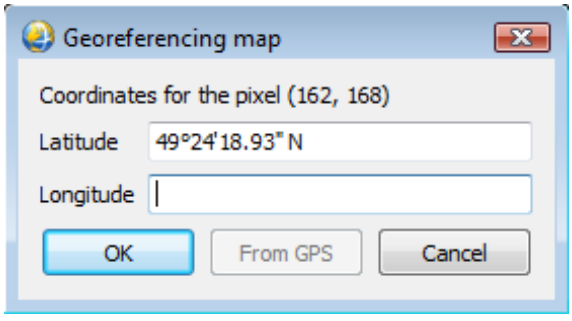
    a. In **Google Earth**, **Add a placemark** and move it to a first reference point. The coordinates of the placemark are shown in the **Google Earth - New** dialog.



b. Copy the latitude to the clipboard.

c. In **Covera Zone**, click on the same reference point position. The **Georeferencing map** dialog will show up.

d. Copy the clipboard into the **Latitude** field.



e. Back in **Google Earth**, copy the longitude.

f. In **Covera Zone**, copy the clipboard into the **Longitude** field.

g. Press the **OK** button to validate the first reference point.

4. Repeat the previous operation for a second reference point. The further from the first one, the better the calibration.

   a. In **Google Earth**, move the placemark to a second reference point.

b. Copy the latitude to the clipboard.

c. In **Covera Zone**, copy the clipboard into the **Latitude** field.

d. Back in **Google Earth**, copy the longitude.

e. In **Covera Zone**, copy the clipboard into the **Longitude** field.

f. Press the **OK** button to validate the second reference point.

5. In **Covera Zone**, click on the **Done** button.

You now have a geocalibrated campaign that you can use with a GPS receiver. You may check that the geocalibration is correct by showing the North on the map:

1. Click on the map area with the right mouse button.

2. In the contextual menu, choose **Overlay** → **North**.

Chapter 6. Frequently Asked Questions

Table of Contents

1. License 114
    Q: I get an activation failure when I use my activation key. Why? 114
    Q: I bought Covera Zone and activated the license for my laptop. What is the procedure to transfer it to a new machine ? 114
2. Network and wireless measurements 114
    Q: My Internet access is slow when I'm running Covera Zone. Why? 114
    Q: What does RSSI mean? 115
    Q: After I've set the scanning interval to 1s, I get weird RSSI measurement. Why? 115
    Q: I have a Wi-Fi interface mon my machine but I get the message "Cannot find a wireless device" at launch. What's the problem? 115
    Q: A flat signal is reported all over the survey area. Why? 115
    Q: Covera Zone does not record anything when my laptop goes into sleep mode? 115
3. Miscellaneous 115
    Q: My firewall software raises an alert when I open the user guide. Why? 115
    Q: How can I speed up the calculation of a view? 115
    Q: What is the maximum number of survey points in a project? 115
    Q: Why are the RSSI values shown in the bottom left different from the measurements? 115
    Q: What are the different methods to calibrate a map? 116

1. License

Q: I get an activation failure when I use my activation key. Why?

A: There are several cases:

- **Connection Error**, make sure there is no firewall either on your machine or on your corporate network, that may block traffic to our license server (port 80).
- **This activation key is not valid**, you've probably mispelled the activation key.
- **Activation is not allowed on this machine**: you've reached the allowed maximum of different machines for this key. If you want to transfer the license from machine A to machine B. Uninstall Covera Zone from machine A (or unregister the license on machine A) before activating again on machine B.

If your failure case is not listed here, please contact the support.

Q: I bought Covera Zone and activated the license for my laptop. What is the procedure to transfer it to a new machine ?

A: Uninstall Covera Zone. During this process, the wizard will contact our license server and unregister your machine. After that operation, you can install and activate Covera Zone with the same activation key on a new machine.

2. Network and wireless measurements

Q: My Internet access is slow when I'm running Covera Zone. Why?

A: If your machine is connected to the Internet via the wireless interface you will notice that the Internet throughput is lower when Covera Zone is running. This is because Covera Zone frequently scans the airwaves, leaving less time for actual traffic to go through the wireless link. If you shutdown Covera Zone or if you decrease the scanning frequency the situation will improve.

Q: What does RSSI mean?

A: RSSI means Received Signal Strength Indicator. It is a measurement of the signal strength, acquired by the 802.11 device in the machine running Covera Zone. See also the section called “Path loss” [10]

Q: After I've set the scanning interval to 1s, I get weird RSSI measurement. Why?

A: Covera Zone will ask your wireless device for a new scan every x seconds. When this interval is set below below 2s the driver may report strange RSSI measurements, depending on the driver implementation. In this case, just increase the interval in the options.

Q: I have a Wi-Fi interface mon my machine but I get the message "Cannot find a wireless device" at launch. What's the problem?

A: Make sure your are running Covera Zone from an account with administrator privileges.

Q: A flat signal is reported all over the survey area. Why?

A: Certain versions of the driver for Broadcom 802.11 chipset will erroneously report a flat signal. The solution is to upgrade your driver to the latest version. For Dell systems, upgrade your driver to 4.100.15.5 or higher (Dell file R140747).

Q: Covera Zone does not record anything when my laptop goes into sleep mode?

A: Covera Zone and the necessary Windows services may no longer be running. Disable the sleep mode (Option Panel > Power >) [to be complete]

3. Miscellaneous

Q: My firewall software raises an alert when I open the user guide. Why?

A: Personal firewall software may issue a warning about the connection Covera Zone makes to the help browser process using the machine's internal loop back interface. This connection is not visible on any external interface and no data is sent to, or received from the Internet.

Q: How can I speed up the calculation of a view?

A: Use the Easy Regression algorithm, instead of the slower Legacy regression. If you really wan to use Legacy Regression, decrease the regularization factor. With both regression algorithms, you can also improve the calculation time by decreasing the **Resolution**. Decreasing the resolution will reduce the quality of the countour lines, but should be OK for heat maps.

Q: What is the maximum number of survey points in a project?

A: The number of survey points Covera Zone can handle will depend on the configuration of your machine. For a typical configuration, you can handle thousands of points. However, opening and saving a project will take more time in this case. If a given source AP is recorded in all these points, the view calculation for this source will be important.

Q: Why are the RSSI values shown in the bottom left different from the measurements?

A: The value that you see in the bottom left of the screen is the calculated value, obtained as a result of the regression. The value that you see as a label below a survey point, is what you've recorded for this point.

These two values are different because the regression algorithm does not "naively" fit to survey point values to account for noise and possible outliers in the measurements. The interpolated value for any given position is calculated from all the measurements around. This produces a smoothing effect and explains why the interpolated value is usually lower than the measurements for the same position.

If the default behavior is not satisfactory, you can manually tune the "Fitting factor" parameter in the "view properties" tool.

Q: What are the different methods to calibrate a map?

A: Covera Zone offers two different calibration methods:

- *Scaling* with only a known distance as described in the section called “Calibrating a map” [20]. This is typically used for scaling indoor floor plans.
- *Georeferencing* with two kwown points as described in the section called “How to georeference a map?” [109]. This method is typically used calibrate maps for outdoor GPS assisted campagins

Glossary

Composition	Superimposition of two or more views that may be added to report.
View	A regression graph plotted over the background map
Survey Point, or point	Association of a position and network measurements acquired from this position.
Station	To be defined.
Source Access Point, or source	Access point recorded from at least one survey point.
Old Access Points	Access point once detected during airwaves scans, but not seen again for a long time.
Received Signal Strength Indicator, RSSI	Radio signal strength reported by the wireless interface to Covera Zone
dBm, decibel	Logarithmic unit for radio signal strength, reported by your Wireless NIC
NIC, Network Interface Card or Network Interface Controller	Computer hardware designed to allow computers to communicate over a network.
NMEA	stands for the National Marine Electronics Association. NMEA 1083 Standard defines GPS data exchange over a serial line.
GPS	GPS, stands for Global Positioning System. A radio-localization system formed from a constellation of 24 satellites. Can optionally be used by Covera Zone for outdoor surveys.
Network Driver Interface Specification, NDIS	Windows API for "Network Interface Cards", including wireless devices. NDIS5.1 is supported in Covera Zone 2.1
MAC address	A unique identifier for all the Wi-Fi access points or NICs.
Service Set Identifier, or SSID	A code attached to all packets on a wireless network to identify each packet as part of that network
Equivalent Isotropically Radiated Power or EIRP	Amount of power that would have to be emitted by an isotropic antenna (that evenly distributes power in all directions) to produce the peak power density observed in the direction of maximum antenna gain.
Path Loss	Attenuation undergone by a RF wave in transit from a transmitter to a receiver. Path loss may be due to many effects such as free-space loss, refraction, diffraction, reflection.
Throughput	In communication networks, throughput is the amount of digital data per time unit that is delivered to a certain terminal in a network, from a network node, or from one node to another, for example via a communication link. The throughput is usually measured in bit per second (bit/s or bps).
Iperf	Iperf is a tool to measure maximum TCP bandwidth, allowing the tuning of various parameters and UDP characteristics. Iperf reports bandwidth, delay jitter, datagram loss.

Index

A

Access Point, 9
- Chase AP, 55
- Data, 85
- Find, 50
- Visibles APs, 53

C

Calibration, 20
Campaign
- Definition, 17
- Manager, 52

Composition
- Create, 81
- Manage, 82

D

Dock Area, 38

E

Equivalent Isotropically Radiated Power, 10

M

Map Area, 38
Modes, 39

R

Report
- Creation, 33
- Manager, 79
- Mode, 79

RSSI, 14
- Sensitivity, 13

S

Signal
- Diffraction, 12
- Loss, 10
- Reflection, 11
- Scattering, 12

Signal Graph
- Dockable tool, 52

Sources
- View filter, 64

Survey Point
- Data, 84
- Definition, 24

V

View
- Contour Lines, 74
- Definition, 29
- Heat map Color Scale, 69
- Manager, 62
- Mode, 62
- Overlay, 65
- Views Properties tool, 63

W

Wireless client, 9
Workspace, 38